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REPORT

ON THE

Teak Forests of Pegu,

FOR

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REPORT

ON THE

TEAK FORESTS IN PEGU.

In submitting my first Report on the Teak forests of Pegu, I do not deem it necessary to attempt a representation of the general features of the same, or a description of the different forest districts. The whole of the information on these points that, in the present imperfect state of our acquaintance with the forests, can be given, has been admirably set forth by my predecessor in his two reports for 1853-54 and 1854-55, the first of which comprehends the southern forests, and the second those in the Sittang Valley, together with a part of those in the Irrawaddie Valley.

2. It appears preferable to discuss several questions of a general character relating to three principal points of forest administration, viz.:

I. How can the produce of the forests be turned to account in the most advantageous manner?

II. Which measures must be taken for the preservation of the forests?

III. What can be done for the extension and consolidation of the forests?

3. Commencing with the first question, we must lay the foundation of our discussions, by establishing a few facts concerning the statistics of our forests. I will first give the numbers ascertained by certain observations, I had an opportunity of making during my first tour through the forests, and then compare them with those contained in the two statistical tables of my predecessor's report for 1855.

I. *On the working of the forests.*

1. Proportions of the Teak of different classes in the forests.

4. From among those forest districts that were visited in my first tour, four were selected, in order to obtain reliable information concerning the actual number of trees of different sizes, standing on a given area. This information would be more complete, had I extended my observations over a larger number of forest districts. But this was impossible, since I could only commence them after being enabled, by my own experience, to select such men from among the forest establishment on the journey, whose accuracy and truthfulness could, to a certain degree, be relied upon. The observations might, by sending out parties in different directions, have been extended and multiplied, had I not preferred admitting only such as were actually made in my presence, so as to enable me, at any time, to ascertain the accuracy of the numbers given by my native assistants.

5. The districts selected were:

I. The forests on the Khaboung stream and its tributaries. The Khaboung is one of the western tributaries of the Sittang, and joins this river a short distance below Toungoo.

II. The northern Nawing forests, on both sides of the northern branch of the Nawing river, which drains the greater portion of the Province of Prome, east of the Irrawaddie.

III. The Kounsouk Choung, another branch of the same river between the northern and middle Nawing.

IV. The Minhla and Mokka forests in the Tharawaddie district on both sides of these tributaries of the Upper Hlaine or Kouktban river, and on their feeders.

6. While examining these districts, all trees of the I. and II. class, that were in sight on both sides of the path or track pursued, were counted, and separately entered in the list. In one district only a further division could be attempted, the trees above 7 feet 6 inches or 5 cubits in girth being kept separate from the other I. class trees, and the registration being further extended to trees of smaller sizes, viz.: to trees of the III. class. In all four districts, the trees killed by girdling and those that had died from natural causes (or Nathat trees) as well as Teak logs and felled trees, were registered separately. The result of these observations is shown in Table I. It will be observed, that some of the total amounts were obtained not by addition of the numbers observed, but by calculation, the proportion ascertained in one forest being considered as standing good for the others. Such numbers, however, as were not obtained from complete observations are marked with an asterisk *.

7. In my survey of the forests I have classified the trees in the following manner:—

I. Class trees of 6 feet or 4 cubits in girth and above.

II. Class trees of 4 feet 6 inches or 3 cubits in girth and above.

III. Class trees of 3 feet or 2 cubits in girth and above.

IV. Class trees of a girth under 3 feet, and seedlings.

The first of the 3 classes proposed in my table, corresponds with the I. class in the tabular Statements in the Report for 1854-55. With regard to the two others, however, a different arrangement was unavoidable. The Burmese are accustomed to classify trees according to the number of cubits which the girth of a tree measures. Those among the natives of Burmah who have been engaged in forest work are generally good judges of the girth of a tree, and are able to state with correctness, without actual measurement, whether a tree has a girth of 2, 3, or 4 cubits, which corresponds to class III. II. and I. in my tabular Statement. It would, however, be exceedingly difficult to teach them to use another classification with anything like accuracy. I was, on this account, obliged to abandon the classification of the Report for 1855, which was fixed according to the number of feet and inches in the girth of the tree.

8. It is remarkable, that the proportions between the trees of the I. and II. class are very different in the different forest districts. This can only be accounted for, by the great irregularity which, under the Burmese rule, prevailed in the felling of trees and the working of the forests. For while in some districts the work of devastation was principally directed against the undersized timber for house-posts etc. in others large trees were felled to be cut up either into short Loozars or to be converted into square logs and large planks. The ultimate result, however, viz., that, taking the forests as a whole, the number of trees belonging to the first three classes is about equal, viz.:

I. Class, ... 2423 trees
II. Class, ... 2503 trees
III. Class, ... 2793 trees

probably well enough expresses the proportion prevailing throughout the whole country.

9. Of the very considerable amount of seasoned timber, about one-third is Nathat, that is, has died from natural causes. The rest is old timber, a considerable portion of which was killed under the Burmese rule, the remainder during the first years of the British

occupation. The amount of the seasoned timber in the forests is of course very variable, it being higher in those forests which have been worked extensively, but the proportion of Nathat timber is probably the same all over the country.

10. The numbers stated in the table may therefore be considered as expressing, with some degree of accuracy, the general proportions of the different classes of standing trees, whether green, or Nathat, in the country.

11. It needs no explanation that all Nathat trees ought to be removed, but that, besides these, no tree *below* 6 *feet* in girth ought to be felled. It will, however, be necessary to state the reasons why it would not be advisable still further to restrict the size of the trees to be removed. The number of trees of a size much larger than 6 feet is very limited. Thus on two days spent in examining a portion of the Minhla forests, 327 trees of the I. class were observed, but only 38 among them had a girth of more than 7 feet 6 inches, so that, supposing the same proportion to prevail in the whole of the four districts, there would be out of the 2423 I. class trees observed only 251 with a girth of and above 7 feet 6 inches.

12. The cause of this remarkable fact, which is equally true for forests that have been worked extensively, as for those that have hitherto been inaccessible to the axe of the timber merchant, appears to be partly the very slow growth of Teak after it has advanced beyond a certain number of years, and partly the circumstance that in the province of Pegu at least, Teak does not appear in general to obtain a great age. The latter point is sufficiently proved by the large amount of standing Nathat trees, of which, by far the greater part belong to the first class and are found to form more than one-third of the trees of this class, although a great many of them are every year being destroyed by the frequent fires which pervade the forests during the dry season.

13. It is my opinion, that this unfavourably small proportion of old and very large trees, does not exist in the Teak forests of all countries, and that, in the interior of this peninsula, especially in the Kareen, Shan and Burmese territories beyond the frontier, it would be possible to fix the standard size for trees to be felled, considerably higher than 6 feet in girth. This opinion is based on the far superior quality and greater size of foreign timber, both that which arrives at Moulmein, and that which is brought down to Rangoon. This cannot

be ascribed to a more skilful or careful mode of working the forests, but to the larger number of good-sized trees, available near the waterways. In our province, however, if the revenue from the forests is to cover the expenses of the forest department, the standard of trees to be felled must not be raised to a girth beyond 6 feet.

14. It is therefore proposed, that in every forest that is to be worked, all I. class trees should be marked, and that so many of these should be cut down every year, as to allow the II. class trees to replace those of the first that have been felled.

2. Rate of growth of Teak.

15. The next point therefore to be ascertained is, how many years does a Teak tree of the II. class, or of 4 feet 6 inches in girth, require, in order to attain the size of a I. class tree or a girth of 6 feet?

16. The answer to a question like this would, in Europe, very easily be found. For owing to the marked difference, which there exists between the cold season, in which all vegetation sleeps, and the warm, in which it is active, every year's increase is distinctly marked in the wood, by what is called an annual ring, and it is therefore only necessary to know the average breadth of these annual rings in the different parts of the tree to ascertain the number of years required for a certain increase in girth or diameter.

17. Although Teak belongs to that class of tropical trees, the wood of which is not uniform, but distinctly divided into concentric rings, and although it is probable, that the yearly interruption of vegetation during the dry season, when the tree is without leaves, is the cause of these concentric rings, so that one ring would actually correspond to one year's increase, yet this supposition is by no means satisfactorily proved. Until it is therefore fully established by scientific researches, we are not justified in judging from the number of annual rings in a certain portion of the trunk of the number of years in which this portion has been formed.

18. Another method of ascertaining the point above alluded to, would be to measure trees of different sizes, the ages of which are known, and thus to find the amount of increase which corresponds to the difference between their ages. I had, a few months ago, an opportunity of making such measurements in the Honourable Company's Botanical Gardens, Calcutta, and in a private garden at Moulmein.

19. The annexed table (Table II.) exhibits the results obtained, the trees were measured in their girth or circumference 3 feet above the ground.

20. It is evident that the growth of Teak is not uniform, the yearly increase for the first six years being: $10\frac{9}{11}$ lines in diameter, that for the next sixteen years $5\frac{8}{11}$ lines in diameter, and the increase for the last forty-eight years only 3 lines in diameter. By interpolation and diminishing proportionately the yearly increase in the years after the age of 70, a more complete scale of the growth of Teak has been obtained, and this is exhibited in Table III.

21. This table also contains a comparison with several other data regarding the growth of Teak in other countries. Thus, columns 2 and 3 exhibit the supposed average rate of growth of trees felled in the plains and on the hills of the Attaran and Houndrow forests, in the Tenasserim provinces. These numbers were obtained by determining the age of the tree from the number of concentric rings in the wood, under the supposition, that one ring was the increase of one year. It will be observed that the rate of growth as calculated from my observations in Calcutta and Moulmein, is slower than that given for the Tenasserim provinces in the plains, but more rapid than the growth of trees 1100 feet above the sea.

The general correspondence, however, between the numbers obtained by two methods so widely different, and in localities of so different a nature, appears to show that both methods may be used for ascertaining the point in question.

22. The data relative to the growth of Teak in Java and in the Bombay forests were obtained, the one from a recent scientific work on this island published by a German Botanist and Geologist, (Franz Junghuhu,) the other from communications kindly made by Dr. Gibson, the conservator of Teak forests in Bombay.

It is remarkable, that the data in columns 1 to 3 stand between those in the 3 last columns, so that the growth of Teak in Calcutta and Burmah, appears to be slower than that in Java, but more rapid than that in Bombay.

23. We are thus justified until more complete information shall be available, in making use of the numbers in column 1, in order to decide the point mentioned above, which is to form the basis of our forest admininstration. For, selecting from among all the data at present available with regard to the growth of Teak, those that occupy the middle place are nearer to the truth than any of the others.

24. It will thus be observed from column 1 of the table, that a tree of 36 inches or 3 feet in girth, requires 21 years to attain a girth of $53\frac{13}{16}$ inches or of nearly 4 feet 6 inches, and that a tree of 4 feet 6 inches in girth, requires 23 years to attain a girth of $72\frac{9}{16}$ inches or little above 6 feet. If we therefore, in the course of 23 years, remove all trees now measuring 6 feet and above, (first class), those of the second class will have replaced them, and those of the third, together with a portion of the fourth will have come into the place of the second.

25. It being more convenient to adopt a term of 24 years than one of 23, it is proposed to work the forests in such a manner that, after the lapse of 24 years, all trees, measuring at the beginning of this period more than 6 feet in girth, shall have been felled and removed.

26. The numbers as stated in Table I. together with our knowledge of the growth of the tree as stated in column 1 of Table III. give us the assurance, that in the present state of the forests, this system may be carried on for 3 times 24 years, not only without causing a decrease in the supply of first class trees, but even securing a gradual increase in the same. The question might, however, be asked, whether the number of plants of a more tender age, and the number of seedlings springing up from the seeds that are scattered by natural causes, are sufficient to ensure a continued thriving state of the forests, after the felling of all first class trees has been repeated three times, that is, after the lapse of 72 years.

27. The number of seedlings and trees of a tender age, varies very much in the different parts of the country, but nowhere are they wanting entirely. Even in the Prome forests, where my predecessor found a total want of seedlings, large numbers were this year observed. Thus in one day in the northern Nawing forests the following were counted.

I. Class trees (measuring 6 feet and above),	29
II. Class trees (measuring 4 feet 6 inches and above),	40
Small trees and seedlings,	500

The principal reason why the young Teak plants in the Prome district were overlooked on the tour of 1855, was the fact that in the dry soil of the Prome forests, Teak remains much longer without its leaves, so that the dry stalks of young Teak can often only be distinguished from the leafless stalks of other young trees by minute examination.

28. With regard to the general proportion of seedlings to full-grown trees in the forests, I can only confirm the estimate given by Dr. McClelland, viz. that about two seedlings to every full-grown tree may be taken as the general proportion. This large number of seedlings throughout our forests encourages the hope, that the supply of first class trees for the fourth term will be considerably larger than that of the preceding ones. At present, owing to the former practice of felling a larger amount of undersized, than of fullsized trees, the proportion between the different classes, is far from being the natural one. In the reports for 1854 and 1855, the extent and the destructive influence of this practice, has been fully shown. I may therefore limit my remarks to a few numerical data.

I. Of 8.349 trees removed from the southern forests up to the 15th November, 1856, on account of the arrangement made with Messrs. E. Fowle and Co. for the removal of all old seasoned timber in that division, not less than 7.266 were undersized and only 1.083 fullsized trees.

II. Of the timber hitherto brought down from all forests in 1856, by the different contractors, these have been collected at—

	Fullsized Logs.	Undersized Logs.	Total.
Toungoo to October 1st, ...	2265	1454	3719
Prome to November 1st, ...	224	1424	1648
Rangoon to December 10th, ...	933	4580	5513
Total, ...	3422	7458	10.880

The destructive practice of felling undersized trees in preference to fullsized having now been stopped, the forests will, by degrees, return to their natural state; and we have therefore full reason to hope, that the supplies of I. class trees will, instead of diminishing in future, be constantly increasing.

29. We now proceed to discuss in particular the manner in which it is proposed to carry out the principle above-mentioned, *every year to remove one twenty-fourth of those trees that at the beginning of the working term belonged to the I. class, or measured* 6 *feet and above in circumference.*

3. System proposed for the working of the forests.

It would be a process neither simple nor easy in its execution, and very difficult in supervision, if one twenty-fourth of all first class trees were actually every year to be felled in every district.

30. In order therefore to facilitate the execution of this principle, it is intended to divide the whole country, in which Teak forests exist, into six large divisions, one of which only shall be worked at a time. A statement of these divisions, together with their area, the probable amount of first class trees contained in them, and the number of logs yearly to be expected from them, if all can be made available, has been given in Table IV.

31. These divisions have been formed as much as possible in accordance with the great geographical features of the country. Thus I. II. III. belong to the Irrawaddie, V. VI. to the Sittang valley, and IV. comprehends the Southern forests, situated on those rivers that join neither the Sittang nor the Irrawaddie itself, but empty themselves into separate branches of the large Delta of the latter river. The divisions have further been formed with a view to give them as much as possible an equal area, or at least a somewhat similar amount of timber available, and to permit of the timber from one division either being collected in one place, or being floated to Rangoon through one and the same channel.

32. The course of operations will be the following—

1. *Marking.* All trees measuring 6 feet in girth and above in the first division, will be marked in 1857 in such a manner that the marks shall remain visible for 24 years. As the increase of teak of that size is slow, (only about 12 inches in girth for 24 years, or .2 inches in radius) this operation can be carried out without injuring the tree.

2. *Girdling.* One fourth of the trees thus marked, will be girdled immediately by a circular cut through the bark, about one inch into the wood. The result of this operation is the death of the tree, and the gradual seasoning which is necessary in this climate. These two operations will, as shown in the table, take place in the I. and II. divisions in 1857, in the VI. in 1861. The trees will always be allowed to

stand three years before felling, which is one year longer than what is generally considered to be sufficient for seasoning in this climate. The only exception to this rule will be the first working of the Tharawaddie forests, where the trees will be felled two years after girdling, because it would not be advisable longer to delay the beginning of the regular working system.

3. *Felling.* This operation has hitherto been performed in a very wasteful manner. In order to facilitate the labour of cutting, a scaffold was erected around the trunk, often 10 feet high or more, so that in districts that have been worked extensively, forests of stumps not seldom from 10 to 15 feet high are remaining, the relics of wasted treasures. A sudden transition to the most rational mode of felling, that is, cutting the tree close to the ground, or even digging out the entire stem together with a portion of the roots, (a practice that is being introduced into some of the German forests,) would be impracticable, for hardly any Burman wood-cutter would be found willing to execute such orders. We must for the present therefore limit our improvements to the rule which already forms an article of every forest contract concluded for this and the next year; viz. *that no tree, the lower part of which is not hollow, is to be felled higher than one cubit from the ground.* The first felling of the timber will, in the first division, take place in 1859, and in the sixth or last in 1864.

4. *Removal of the timber.* The time for the three operations already described is the dry season; for the removal of timber, however, the rains are the most advantageous part of the year. For carts and wheels being quite useless in this country without roads, the logs must be dragged over the ground, and this work is far easier over ground that is saturated with water, and therefore offers less friction to the gliding over it of heavy masses, than an uneven dry soil. The deep furrows in the ground that pervade all forests, lately worked, very strikingly remind us of the traces which the heavy sledges laden with timber leave behind them on the snow in Europe. Yet snow covers the rough ground with roads far better than those formed by the rains of the South West monsoon in the heavy clay-soil of Burmah. The rainy season has, moreover this advantage, that numerous water-courses which are quite dry in the North East monsoon, contain sufficient water to float timber to the main stream in the rains, or to the main tributaries. The fourth operation differs also in this respect from the three former, that whereas those can and must be completed in the same

season in which they have been commenced, the removal of the timber from the forests is a long and uncertain work, depending for its success in a great measure on the amount of rains, and the consequent larger or smaller amount of water in the streams and streamlets. Besides which, it is necessarily affected by the greater or less degree of sickness almost invariably prevailing at that season, among the men as well as among the elephants employed in forest work. It is evident that the removal of the whole of one year's fellings will, in general, require more than one, not seldom three or four working seasons.

33. After the completion of the first quarter of the *first* term of 24 years, the operations of which are exhibited in Table IV., the second girdling will commence in 1862, and the second felling in 1865. After the operations of the second quarter shall have been completed, one half of the trees marked in the beginning will have been removed; after the end of the third, three-fourths; and after the end of the fourth or after 24 years, none of the trees that now measure 6 feet and above, will be left standing.

34. The results of the *second* marking, which is to form the beginning of the *second* term, will then show whether in the different districts an increase or a decrease of I. class trees has taken place, or, in other words, whether the period of 24 years allowed for the renewal of the forests, has been sufficient or not.

4. Comparison of this system with those usual in Europe.

35. The system here proposed is widely different from those generally pursued in most forests of the Continent of Europe, but there are three circumstances of decisive importance which, for the present, render it impossible to regulate the Teak forests in Burmah according to the rules of a scientific forest administration.

36. *First.* The European forests consist either of one kind of trees only, or of a few kinds, not very different in their value as timber. In the Teak forests of Burmah, however, Teak forms only a very small proportion of the forests; the greater part of which consists of various trees, mostly growing much faster than Teak and much more able to propagate themselves by natural means, but almost all of which are, in comparison with Teak, at present of very little or no value. The operation of thinning therefore, which in Europe is one of the most important modes for obtaining timber from a forest, and which in the young Teak forests of Bombay has, for several years past, been carried

on with decided success, would, in this country, have no meaning at all. Nor would it be practicable to adopt the system of clearing certain portions of the forests with a view to renew them either by natural propagation, or by planting.

37. The *second* point is, that the forest administration in Europe is based on well explored laws for the yearly increase of the different trees, in different soils and localities, a knowledge which, as regards the Teak tree in this country, is as yet very imperfect.

38. The *third* point is the impossibility of obtaining such assistants as are practically acquainted with the management of forests, and the difficulty of making native and other subordinates strictly adhere to any instructions that are not in accordance with what they have been accustomed to consider right and proper.

39. We may, however, hope that the three causes mentioned, which at present render a forest administration on scientific principles in Burmah impossible, will, in time, be removed. It is to be hoped that our efforts to change by degrees the general features of the Burmese Teak forests, and to render them, if not actually *pure* forests, at least more consolidated and less scattered than they are at present, will not remain entirely unsuccessful. We may further expect, that after the completion of at least twice the term of 24 years, we shall be sufficiently acquainted with the rate of growth of Teak in different localities to substitute for the present artificial system, a more natural one. We may then dispense with the expensive and cumbersome operation of marking, and adopt for those forests, that are not to be worked by thinning or by cutting out whole portions with a view of replanting them, the method of felling yearly (or from time to time) such a number of trees of the larger sizes as shall correspond to the increase of Teak to be expected in that particular forest in the given period. We may also hope that in time a sufficient number of assistants will have received such a training as will enable them to carry out the more difficult instructions of another system with accuracy and independent judgment.

40. The measures for accomplishing the first point, will be discussed in the second part of this report, the object of the second will be attained partly by scientific researches on the rate of growth of Teak in tender and riper age, as well as under different local and climatic circumstances, partly by a strict adherence to the plan proposed,

for at least twice 24 years. A commencement of the scientific researches with regard to the growth of Teak and other trees, was made in April last, in the Toungoo forests, and the observations connected with it, will be continued at the commencement and at the end of every dry season. The third point, the training of the assistants, can only be accomplished through the work itself. Even the present system offers opportunities enough for the assistants to exercise their judgment, and to prove their accuracy. For although the rule is a very simple one, that in every district, of the trees marked in the beginning of the term, first one-fourth, then one-third, then one-half, and at last the remainder is to be girdled, the modifications to which it must necessarily be subjected, render its practical application somewhat difficult.

41. And first we must mention a few circumstances, that will tend to *increase* the number of trees to be girdled and felled. All trees of whatever size they may be, that show evident signs of decline and decay must be girdled at once. For trees that are beginning to be Nathat, this measure is desirable, because the timber of a Nathat tree is always inferior in appearance, and often in quality, to that of a sound tree. For those trees that show signs of decline from having been attacked by a parasitic ficus, which is particularly destructive to Teak trees in this country, this measure is necessary, if we wish to save their timber from destruction. For the ficus in a short time so entirely surrounds the Teak, as if with a coat, that the latter is not only killed, but its wood becomes so intimately connected with that of the parasite, that it is almost impossible to separate them. The timber therefore of a tree killed by a parasitic ficus is of little or no value.

42. This addition to the amount of trees to be girdled every year will, however, be more than counter-balanced by several circumstances, that tend to *diminish* their number. The first is: that all isolated trees must be spared, in order to obviate a want of seedlings in places to which the seeds of other trees could not be carried by natural causes. The second is, the necessity of reserving certain districts for such operations as will gradually change them into pure, or nearly pure, Teak forests. In such reserved forest districts every thing must be done to decrease the number of other trees and to increase the number of Teak trees as much as possible. No Teak must therefore be felled in these districts, those trees excepted where commencing decay demands their immediate removal.

43. The rules laid down for the selection of the trees first to be girdled in preference to others, likewise require the exercise of independent judgment on the part of the subordinates. That it is preferable first to girdle such trees as stand in groups and such as overshadow small trees, or such as are beginning to be hollow, are rules of a very simple nature; still their accurate execution cannot be expected from untrained native subordinates. A copy of the Instructions for marking, girdling, etc. is annexed to this report.

5. Amount of timber yearly to be expected according to the new system proposed.

44. The question remains now to be answered how large an amount of timber may be expected every year, if the system proposed be faithfully carried out. The number of trees that were ascertained in the four forest districts, as mentioned in para. 8, were observed on an area of about 30 square miles. The size of this area has been ascertained by estimating the distances accomplished every day, together with the deviations from the road pursued. The aggregate amount of the distances accomplished was about 150 miles. Now, as it was possible to ascertain the trees of the different classes to a distance of from 100 to 250, or on an average of about 170 yards on both sides of the road, the trees counted were observed on a strip 150 miles long, and 350 yards, or one-fifth of a mile broad. The area, therefore, on which the trees counted stood, was about equal to 30 square miles.

45. Now, as on this area 2423 I. class trees were observed, there were seen about 80 trees of 6 feet girth and above, in one square mile, a proportion which, I believe, tolerably well represents the average distribution of I. class trees over the whole of our forests. It must, however, not be forgotten, that these trees are by no means equally distributed over the whole of the forest districts, and that many miles in the forests will be found entirely without any Teak, while in other parts Teak forms a very considerable proportion of the trees in the forest.

Of the latter, we will mention a few instances, as they serve to prove, that Teak can, in this country, form pure, or nearly pure forests. The King of Burmah and several Governors of the different districts appear to have had the wisdom to declare certain forest districts in their country, reserved districts, and to forbid the felling of Teak in the same. In some cases Teak was even planted. This is the origin of a number of small Teak forests, that are to be found

in the lower portions of the province. The finest of these is the Royal forest at Emmah in the Prome district, 20 miles from the Irrawaddie, an isolated Teak forest, covering about one square mile and containing about 1300 I. class trees of fine growth and great value. In this forest, a religious superstition has, perhaps in a greater measure than even the King's command, secured the protection of Teak against injury. Nobody ventures even to remove a leaf from fear that the Nats or Genii of the forest will punish the offender. The forest is situated in the midst of a comparatively fertile and well-populated country; hence all the other trees in it are cut down for firewood, so that the forest is gradually becoming more and more a pure Teak forest.

Another instance is the Tahpoon forest in the Tharawaddie district, a forest smaller in extent, and much less pure than the former, for it covers only half a square mile, and contains about 150 I. class trees which would be 300 to the square mile.

I will now give an instance of a larger forest district, which has not been improved by plantation nor protected against injury, in which the number of I. class Teak trees has lately been ascertained independently of my own observations, and which may serve to prove, that the result given above comes near to the truth. This is the lower part of the Thaukyagat forest near Toungoo. Its length is about 8, its average breadth 3 miles, it covers therefore 24 square miles. The number of I. class trees in this forest, has been estimated by my assistant at Toungoo, after visiting every part of the same himself, at 2000 trees. This gives 83 trees to the square mile.

46. Taking 80 as the average amount of I. class Teak trees on the square mile, the number of those trees in a certain forest district, the area of which is known, can easily be ascertained. The results of these calculations are exhibited in Tables IV. and V.

47. It will be seen that Table IV. gives the amount of I. class Teak trees in all forest districts together, equal to 584,960. This number is considerably higher than that given in the tabular statement annexed to the report of 1855, which shows only 43,500 trees of 6 feet in girth and above.

48. But it must be remembered that the latter statement includes neither the southern forests nor the forests west of the Irrawaddie, and further, that it was made exclusively from the returns obtained

from the Goungways or native subordinates of the department. These are very useful in their way, but their statistical returns of the forests are, in most cases, far from accurate. This is evident from Table V. of this report, where the results of my observations and the numbers given by the Goungways are compared with each other.

49. In a small portion of the Khabong forests while travelling through it, I saw and counted myself 1296 I. class trees. The Goungway's register gives, for the whole forest, only 1650.

While travelling through the Kyounsouk forests, I saw in two days 162 trees above 6 feet in girth. The Goungway gives 295 for the entire district.

50. With regard to seasoned timber, their want of accuracy is apparent even in a higher degree. The Goungways give for all four districts together 4261 seasoned trees, and I have observed 1969. It is not likely that in travelling through a small portion of the four districts, I should have met with nearly one half of all seasoned trees existing in the same. Thus, it is not to be wondered at, that my estimate of the I. class trees in those 4 districts, is more than five times as large as that of the Goungways.

51. The principal reason for this want of accuracy is the fact, that only very few Goungways are acquainted with the whole of their district. I have, on my late tour, frequently had opportunities of testing the local knowledge of these subordinates, and have found, in most cases, that whenever I directed my excursions away from the paths and roads, the country appeared entirely unknown to them, and that we, not seldom, met with patches of Teak, where the Goungways had denied the existence of this tree.

52. I fear, that in most cases, the numerical returns of the Goungways are more the result of general opinions entertained by them, or concocted during their 'dolce far niente' with their friends and relatives, than of actual observation.

53. The operation of marking all trees above six cubits in girth, which will be completed in 1862 for the whole country, will give us a more accurate idea of the actual number of full-sized trees in the country, than can at present be formed from any data available. We shall then see, how much the numbers contained in Table IV. as the probable amount of timber to be expected from each of the 4 forest districts, deviate from the actual state of things.

54. But even supposing that these numbers were correct, they would not give an accurate expression of the actual amount to be expected. We have above already alluded to several modifications, to which the numbers of trees to be girdled will be subjected; we will now proceed to discuss several other circumstances, that will materially diminish the amount of timber available, at least for a considerable number of years.

6. Causes that will prevent the whole amount from being brought down.

55. The produce of entire forest districts cannot be brought to the main river, because the streams, which in this country form the only means of communication by which timber can be brought down, are obstructed in their course, some by rocks, others by accumulations of masses of living or dry vegetation.

56. Obstructions of the latter kind are very frequent in many tributaries, both of the Sittang and the Irrawaddie valley, especially in the lower part of their course, where their beds are not in deep ravines, but shallow, and not seldom spread out into numerous branches. The origin of these accumulations of trees, branches, sand, etc., is either an accidental stoppage in the bed of the river, caused by a fallen tree, or by a few logs of timber not removed in time before the fall of the water, or it is the over-luxuriant growth of jungle which takes possession of the bed of the river, narrowing its channel and dividing it into several branches.

57. Examples of such obstructions are, in the Sittang valley, those of the Yainway and Binedah Choung, which of late have prevented any timber from being brought down from these forests. In the Irrawaddie valley, the Minhla Choung, a tributary of the Upper Hlaine or Koukthan river, where every log has, for a long distance, to be dragged overland by buffaloes, before reaching the lower unobstructed part of the river. Similar obstructions make it necessary to remove the timber growing near the Magayee Choung and its tributaries on carts a distance of 6 miles to the Oukkan Choung, another tributary of the Hlaine river.

58. The removal of these and similar obstructions, will require some outlay of capital, but will be a matter of no great difficulty, and will undoubtedly amply repay its expenses within a short time.

59. Far more difficult are those obstructions that are caused by rocks, which either make the channel too narrow, or render the course

of it so irregular that logs cannot pass through it and often are broken to pieces by the force of the current.

60. In some instances such obstructions, though of formidable appearance in the dry season, offer no impediment to the floating down of timber in the rains, as the water rises high enough to cover the rocks, or at least to render the passage between them wide enough for the purpose. Of this kind is the magnificent water-fall of the Khounsonk river, one of the branches of the Nawing, at Kadignazin, which, in the dry season, appears as an insuperable obstruction, but where, in the heighth of the rains, to give the expression of the Burmese foresters of that district, it is awful to see how one log after the other takes the leap over the rocks into the deep abyss below, and then quietly floats on in the smooth waters beneath.

61. Of the other kind are the rapids of the Koon and Hpoo Choungs, two of the principal western tributaries of the Sittang river. These rapids, which block up the course of the rivers, just before they leave the hills and enter the plains, are from 5 to 6 miles long, and in some places the water rushes through narrow channels dug out between high walls of rock, in others the bed is filled up with large detached masses of stone broken off from the barrier of rocks that once opposed itself to the torrent.

62. The forests on the upper part of these Choungs have never been worked, and are probably the richest in Burmah. Here Teak is to be met with, not only at a distance of 2 or 3 miles from the waterway as in other districts, but it is found to cover the slopes of the hills close to the principal river and its tributaries. In these regions this valuable tree has only had to contend with one enemy, viz. with the hill cultivation or Toungyas. If this destructive mode of cultivation had not converted more than one half of the country into an impenetrable and unhealthy wilderness, the whole would probably be one uninterrupted forest, with Teak as one of its prevailing trees.

63. But even now, the treasures of these forests will, in one or two harvests, more than repay the outlay to be made for the removal of the obstructions just mentioned. Every preparation has been made for the purpose, sketch maps have been taken of the whole of the rapids, and most of the rocks to be blasted have even been measured, so that it is to be hoped, that before the time for working these forests arrives, these two important water-ways may be cleared; a work which

will not only increase the supply of timber, but throw open the fertile country above the rapids to trade and an enlarged population.

64. Similar rapids have hitherto entirely shut up the Bobain forest in the Tharawaddie district, and are obstructing the courses of numerous smaller tributaries which, if cleared, would become important channels for the timber growing on and near their banks.

65. But even these difficulties may be removed in the course of years, and thus the amount of timber yearly available, increased. Still after the opening of all the principal and minor water-courses shall have been completed, a considerable number of trees will remain unavailable, as their removal is connected with difficulties that cannot be at once overcome, though they may be conquered by long experience and a gradual increase in skill on the part of the workmen employed.

66. Such is not the case with any of those forests that are situated in the plains, for though the absence of roads forbids the use of wheels and carts, timber is dragged during the rains with comparative ease for long distances to the water-way by elephants as well as by buffaloes. But unfortunately almost all forests in the plains have been so much reduced by the wasteful working of former years, that for many working seasons to come, they will only yield a very limited amount of timber.

67. The only rich forests are those in the hills, and these, though not very high, are still steep and irregular enough to make the dragging of logs to the water-way a most difficult and sometimes an impracticable undertaking. This is especially the case for all those trees, that are on slopes or ridges, not immediately contiguous to a water-way, but standing at some distance from the same. Such trees have hitherto never been touched, except by the cultivators of Toungyas, and can only be made available, by smoothing into a kind of road the irregular and widely branched ridges, or the equally tortuous and uneven ravines, over and through which the logs must be dragged to the water-way. Here and there works will have to be undertaken, in order to improve these tracks, and sometimes it will even be necessary to construct rough bridges, to open a road for the produce of whole forest districts.

68. There is one circumstance besides those mentioned, which will sometimes cause some irregularity in the supply, and will, it is to be feared, involve in some cases the loss of considerable quantities of timber. This is the peculiar difficulty and danger which rafts of timber

have to encounter, when floated from Sittang down by the creeks to Rangoon.

69. These are of two kinds. During the spring tides which occur twice a month, the bore in the lower part of the Sittang river is so violent, that those rafts which happen to meet the same, are rarely saved from destruction. Hence, many thousand logs of timber have been lost, some of which have been drifted out to sea, and others are said to be buried in the wide sandbanks near the mouth of the river.

70. A difficulty of another kind awaits the rafts in their passage through the creeks. The channel, which is practicable for timber only for two or three months in the year, is shallow, narrow and winding, and it does not seldom happen that rafts, which had been delayed at Sittang in order to avoid the bore are, through a sudden fall of the water, at once left high and dry, and thus detained until the rise of the water in the next year sets them afloat. Thus owing to an unexpectedly early fall of the water, only a small portion of timber from the Sittang forests has reached Rangoon, and several rafts have been stopped on the way, that must now be watched at considerable expense for nearly a year, until the flood of next year shall release them.

71. To bring the timber from the Sittang forest to Moulmein, would hardly be less difficult or dangerous. The projected canal, however, which it is expected will make it possible to bring down timber during all seasons of the year, and which will facilitate the entrance from the Sittang river into the creeks will, [if completed,] if it does not entirely remove the danger, at least contribute towards rendering the supply of timber from Toungoo more certain than it can be at present.

72. Taking together all hindrances and difficulties discussed above, it is evident that, for a long series of years to come, it will not be possible to bring to market the whole amount of I. class trees that might be felled every year which, as stated in Table IV., will be likely to vary from 18,700 to 39,000 logs a year. The estimate of my predecessor, viz. 13,000 logs a year is, therefore, for the first years at least, probably not very much under the amount that will actually be brought down from the forests.

73. We now proceed to discuss the task to be fulfilled, before the timber that will be seasoned under the new system, can be brought down, that is before 1859. This task is the removal of all or the greater

7. Amount of old seasoned timber at present in the forests.

portion of the seasoned and Nathat timber, at present lying in the forests.

74. The amount of the same is very considerable, but to form anything like an accurate estimate of the numbers is hardly possible. In the report for 1855 the number of seasoned and Nathat timber contained in the southern forests and sold under notification dated 30th May, 1854, to Messrs. Fowle and Co. is stated to have been 12,512 logs. Of these there have actually been removed from the forests by the purchaser, 9,615 logs. Hence the remaining would be only 2,897 logs. But the amount left at the close of the contract in the forests, according to the last statement made by the Goungways, is about 7,813 logs. Add to this the number of trees girdled by order of my predecessor, which will be available in 1857 and 1858, 4,500 logs. (In Table VI. of the Report for 1855 a larger number, viz. 8,056 trees are stated to have been girdled by the orders of the Offg. Superintendent of forests. But a recent investigation has shown that the orders were only partly executed by the subordinates of the Department. Hence the difference) and the number of seasoned and Nathat trees available before 1859 from the southern forests will be 12,313 logs.

75. The amount of seasoned timber contained in the remaining forest districts, with the exception of those on the west side of the Irrawaddie, is stated in the same Report as equal to 22,107 logs.

But this statement is, like that of the southern forests, based on data which, as shown in para. 47, are in general far too low.

76. An amount many times larger is obtained by employing the numbers obtained in the four districts above-mentioned in Tables IV. and V. Here about 66 Nathat and seasoned trees, standing and felled, were observed on one square mile. So large a proportion is, however, not to be found in the other districts. It is perhaps nearer to the truth to take only 25 seasoned trees as the probable amount of seasoned timber on a square mile, thus the whole of the forests except the southern division would contain, 25 × 6240 square miles = 156,000 Nathat and seasoned trees. Add to this 12,313, remaining unremoved in the southern forests, and the amount will be 168,313.

77. But of this number the jungle fires will probably destroy or render valueless *one-third*, in the dry seasons of 1857 and 1858, and on account of the obstructions, few of which will be removed before 1859, *another third* will have to remain in the forests, so that only about

56,000 will be available. Of these, 13,000 logs will probably be brought down on account of the contracts concluded this year; there remain therefore, for 1857 and 1858, 43,000 logs, which would give an average supply of 21,500 logs per year.

78. It is, however, not likely, that the contractors will find it worth their while to bring down the whole of this amount, because it is spread over the whole of the forest districts, and not concentrated in one division only, as it will be after the working according to the new system shall have commenced.

79. These facts will now enable us to see that it would not have been advisable, to delay the opening of the regular forest work beyond 1859; for a delay of another year would be likely to cause an interruption in the supply of timber, and in the employment to be given to contractors, which would render it difficult at the beginning of the regular work, to obtain the services of efficient forest contractors for the same.

80. For I must here beg to observe that there is in this country no particular class of people who make it their business to cut th timber, drag it into the water and float it to market, and whose services would always be available for these purposes. If a class of foresters existed in this country, as in those forests that send their timber down to Moulmein, in possession of the only efficient means for bringing down timber, viz., elephants, and who by long experience have acquired a certain degree of skill, it would have been no difficult undertaking to work the forests on Government account.

8. Contractors engaged for removing the old seasoned timber from the forests.

81. But instead of finding a class of foresters ready to do the work, and provided with the means of doing it properly, a host of rogues were ready enough to enter into contracts and to receive advances, and either to make away with them or to carry on the work in the disorderly and wasteful manner which has hitherto been the bane of the Rangoon timber trade, and the destruction of the Rangoon forests. The result would not have been accordant with the wishes of Government if contracts had been entered into with this class of persons.

82. Only in the Toungoo forests, and in two of the others was it found possible to secure the services of efficient and experienced foresters with elephants, who had two years ago come from Moulmein, in order

to be employed in the removal of bonâ fide private timber from the Sittang forests. In the others it was no easy task to obtain the services of men of sufficient means and influence and of reputed good character, and those obtained had only buffaloes at their disposal, and could therefore, as the cutting up of large logs into small timber had been forbidden, only attempt to remove a portion of the under-sized logs, and such of the full-sized as were near the water-way.

83. Thus the contracts concluded for this year were made with parties of very different classes and occupations; for out of the twenty-four contractors engaged were:

Myookes,	1
Tikthagees,	2
Subordinates of the Forest Department,	11
Burmese timber merchants,	4
Persons of no particular trade,	1
Foresters from Moulmein,	5
Total,	24

84. In order to improve this state of things, a number of Moulmein foresters must be induced to come over to this province with their elephants, and enterprizing inhabitants of this country must purchase a number of these animals, without which timber of good sizes cannot be brought down from our forests. Measures thus to effect the gradual introduction and formation of an effective class of foresters have been taken, and have succeeded so far, that two of the southern forests as abovementioned are at present being worked with elephants.

85. But these measures can have little chance of success, unless uninterrupted and profitable forest work can be offered for a number of years to the contractors, who, if they should find their hopes disappointed, will not hesitate to return to their former profitable occupation in the forests of the Shan and Kareen countries, or may even be induced to employ their elephants in the royal forests beyond the Burmese frontier, if the report be true that the use of these animals for forest work is likely to be permitted by the King of Burmah.

86. The difficulty of securing the services of effective foresters with elephants for the forests of this country is so much the greater, as there is one peculiar disadvantage here which is not felt on the Martaban side. Here the catching of elephants is prohibited: there it is permitted. Every animal therefore, that dies or is lost during the working season (and the number of such losses is always considerable,) must be replaced from beyond the Panlong mountains, or from the Salween valley, either viâ Shouegyeen or viâ Moulmein, a journey always long and expensive, and during the rains wholly impracticable; whereas on the Martaban side the foresters have constantly a supply of these animals at very low prices at their command.

9. Which of the modes for bringing down timber is the most advantageous?

87. We will now proceed to discuss a few of the conclusions that may already be drawn from the results of the arrangements made for the removal of the old seasoned and Nathat timber during this season from our forest.

88. There appear to be three different modes of obtaining revenue from the forests, and these three modes have been employed more or less in the administration of the forests of this country and of the Tenasserim provinces.

I. The levying of a duty, either uniform or *ad valorem* on every log brought from the forests, the felling of the trees being either free, or restricted to the holders of a permit or grant. This mode has laid the foundation of the important timber trade of Moulmein, but has, at the same time, served to destroy the Attaran forests in less than 25 years.

II. By selling the whole of the seasoned timber existing in a certain forest district to the highest bidder, the price on each log, or each separate class of logs, being stipulated at the sale. This price to be paid for the timber when it is brought down from the forests. On this principle, as mentioned in para. 74, the greater portion of the seasoned timber of the southern forests has been removed within 1854, 1855, and 1856 by Messrs. E. Fowle and Co.

III. By bringing down the timber from the forests on account of the Forest Department, and disposing of the same by periodical sales to the highest bidder.

89. The operations of this year have been conducted according to the last principle, it having been recommended by the Supreme

Government in preference to any other. The results now before us will serve to show—

1st. That the third principle is practicable in this country and

2nd. That it is likely to give a higher revenue than either of the two others, though not in the same measure as might at first sight be expected.

90. The discussion of the first of these two points would be superfluous, had it not been a very general opinion, not only among those engaged in the timber trade of this country, but also among Government officials, that any attempt to work the forests on Government account would be a failure, and that the only result would be a serious interruption in the supply of timber at Rangoon.

10. Bringing down of timber on account of Government is practicable.

91. The arrangements for entering into contracts for the purpose of removing Government timber from the forests were commenced on the 10th of February, the first contract was concluded on the 1st March for the Bohmee district, and the last on the 14th July for the Maizelee forests. Notwithstanding the short time given, which, in most cases, rendered it impossible for the contractors to make arrangements for felling the trees still standing, and limited their operations to the logs already felled, the following amount of timber has been brought down.

To Toungoo to the 1st of October, ...	3,719	logs.
To Prome to the 1st November,...	1,648	,,
To Rangoon to the 10th December, ...	5,513	,,
The total amount is therefore,.....	10,880	,,
And as there are still expected or on their way, ...	2,200	,,
The amount likely to come down this season is, ...	13,080	,,

This has been accomplished by

9 contracting parties, in 12 forest districts, with about 100 elephants.

15 Ditto ditto in 18 forest districts with buffaloes.

Total 24 Ditto ditto 30 forest districts.

The number of forest districts in the whole country, including those districts that will still have to be formed on the west side of the Irrawaddie, where they have not yet been fixed, may be estimated at about forty-five, so that timber has been brought from two-thirds of the whole of the forest districts already.

92. The question therefore, whether it is possible to bring down timber on Government account is thus decided in the affirmative. But it still remains to be shown, that the rates paid to the contractors and the other expenses connected with bringing down the timber,—further, the unavoidable losses by breach of contract, from fraud or robbery, or from natural accidents,—are not so considerable as to preclude all possibility of a revenue from our operations.

11. This mode for the present more advantageous, than either the duty system or the system of selling the seasoned timber in the forests.

93. We will begin with the latter point. It could not be expected that this first working season would be completed without attempts at dishonest transactions being made.

a. Losses from dishonest transactions.

94. In the Tharawaddie district, several contractors and subordinates of the Forest Department found it more profitable, secretly, after erasure of the marks of the Forest Department, to sell the timber which was being brought down on Government account to private parties, and to exchange a number of fine large logs for an equal number of inferior ones. As most of the subordinates of the Forest Department of that district appear to have been more or less implicated, or at least to have connived at the fraud, it would probably have remained unnoticed, had it not been for the energy and vigilance of Capt. D. Brown, the Assistant Commissioner of the district. With his vigorous assistance, it has been possible to take such measures as will secure the recovery of the stolen timber, and the detection and punishment of the culprits. A recurrence of similar frauds can in this country scarcely be prevented as long as private timber grown in Pegu is permitted to be an article of trade.

95. It appeared therefore a necessary measure, to limit the time to which private timber grown in Pegu and intended for sale or export may be passed for duty at the revenue stations. This limit has been fixed for the 1st January, 1858, in the appended notification, dated 20th October, 1856, and issued by orders of the Commissioner and Governor-General's agent. This measure is no more than a natural

consequence of the former measures taken for closing the forests. The first step was, as will be remembered, the permission to bring away bonâ fide private timber from *within* the forest limits in the southern forests up to the 30th May, 1854, in the others to the 1st January, 1856. By now permitting the owners to bring to market up to the 1st January, 1858, such of their timber, as may still be lying in the district *outside* of the forest limits, more than ample time is given for this operation. After the 1st of January, 1858, therefore, only such private Teak timber can form an article of inland trade in Pegu, as has passed the foreign Custom houses at Thyetmew or Toungoo, or as has been sold to private parties by the Forest Department.

96. Another species of fraud lately attempted with regard to Government timber is the following: the contractor of one of the Sittang forests near the frontier has preferred dragging a portion of his timber to the main river in the Burmese territory, with a view afterwards of having the same imported into the British territory as foreign timber. The measures that have been taken for defeating his plans and punishing the culprit will, it is hoped, deter others from attempting a similar fraud, which can otherwise not be prevented, since some of the best forests are situated partly in the English and partly in the Burmese territory.

97. It would carry us too far if we were here to enter into all the various dishonest transactions, that have this season been attempted with regard to Government timber. Even near to the timber depôt of Rangoon, the rafts are not safe before they are drawn up on to the bank, for it is not difficult, in a dark night, unobserved to cut off a number of logs and to secure them in places that cannot easily be discovered. Transactions in timber in Burmah have in past days been the field of the most refined roguery, and we cannot expect that this state of things can at once be changed.

98. In one respect, however, a decided improvement has taken place. Formerly the system of giving advances to parties undertaking to bring down timber was the basis of all forest work. A large portion of these advances was never repaid, and those engaged in the timber trade were obliged to compensate for the losses in capital by taking interest at an exorbitant rate. Yet, without giving advances, it would have been impossible to bring down any timber this year on Government account. The total amount of the advances given has

been Company's Rs. 5,750; of this amount the sum of Co.'s Rs. 4,199 has been refunded, and Co.'s Rupees 1,551 remain still to be repaid. Thus losses in this respect are not to be feared for this year.

99. As regards the amount of revenue to be expected from our operations, the following data are available. Three thousand six hundred and ten logs of all descriptions of the timber brought down this season on Government account, have been disposed of by sales.

b. Prices realized at the sales of Government timber.

100. One portion, viz. 2,453 logs has been sold to the Executive Engineer in Toungoo, and the remainder by public auction in Rangoon. The prices given for the former were considerably lower than those hitherto paid for timber at Toungoo, but as the logs were of inferior quality, many having been injured by the jungle fires, and as the rates for floating timber down to Rangoon by the Sittang were so high this year, that it was very doubtful whether the sale of it at Rangoon would have given a higher profit, the disposal of the timber in Toungoo appeared an advisable measure.

101. On the other hand, the prices realized at the first sale of Government timber in Rangoon were higher than the prices which may in future be expected, so that on the whole the result of these two sales is likely to convey a fair idea of what the result of our operations will be for the next few years.

102. The results are shown in three tables. In No. VI. the different items of the expenditure incurred on behalf of the timber are exhibited, with the exception of the salaries of the establishment. In No. VII. the amounts realized by the sales are compared with the total expenses incurred, as stated in Table VI. In No. VIII. the difference between the net amounts obtained by this year's operations, and those which would have been realized on the same amount of timber by the duty system and by the system of selling the harvest of certain forest districts to the highest bidder are compared.

103. From Table VII. it will be seen, that the amounts realized by the sales per ton as well as per log are very different. The lowest amount realized was for Yatthits in

Rangoon, ...	Co.'s Rs.	7	8	3 per log.
	Co.'s Rs.	15	0	5 per ton.
In Toungoo, ...	Co.'s Rs.	1	0	0 per log.

The highest amount was obtained for long pieces (from 50 to 60 feet long).

In Rangoon,..... Co.'s Rs. 128 12 0 per log.
Co.'s Rs. 81 3 8 per ton.
In Toungoo,..... Co.'s Rs. 40 0 0 per log.

104. The expenses incurred for bringing the timber to the place of sale, as exhibited in Table VI. are of seven different kinds.

c. Expenses for bringing the timber to the place of sale.

First. For felling the seasoned trees standing in the forest. This amount is fixed at Rupee one per tree in the contracts for the Toungoo forests, in the other contracts no separate allowance for this operation has been made. It will be observed that nearly one half of the trees sold at Toungoo were standing.

Second. The rates paid to the contractors for removing the timber from the forests, and bringing it to the places of delivery in this year have been the following.

1. *Rangoon.* For the timber from the Southern forests, and the Southern portion of the Sittang forests.

2. *Toungoo.* For the Northern division of the Sittang forests.

3. *Tsanjouai.* On the Hlaine river for the Southern Tharawaddie forests.

4. *Pyimagoung.* On the Koukthan (the upper portion of the Hlaine river) for the Northern Tharawaddie forests.

5. *Prome.* For the Prome forests both on the East and West side of the Irrawaddie.

6. *Akouktoung.* For the Southern forests West of the Irrawaddie.

Third. Floating to the place of sale. For that timber which is not delivered at Rangoon or sold at Toungoo additional expenses are incurred for the floating of the same from the place of delivery to Rangoon.

Fourth. Securing drawing up on to the banks.

Fifth. A mortization fund for lost elephants.

Sixth. Keeping and feeding of elephants.

These last three items are caused by the necessity of securing the timber by dragging it up on the bank at those places where it must be kept for some time before the sale, or before it can be sent down to Rangoon.

A portion of this work can only be done with the help of elephants, and therefore five of these animals were purchased for the Forest Department at Shoaygyeen at the amount of Company's Rupees

2,700. But this measure has been a source of great loss instead of gain to the Forest Department. For of the whole number only two remain and are employed in the timber depôt of Toungoo. One died soon after the animals arrived at Toungoo, and the two others that had been sent to Rangoon died suddenly a few weeks after their arrival.

The capital sunk in the purchase of the three elephants lost, will be charged against all timber that shall this year be brought down to the depôt where the loss took place and the share which each portion of the timber sold has to bear is shown in the column "A mortization fund for lost elephants." The statements in the two other columns: require no further explanation, the one exhibits the expenses incurred for coolies, where elephants were not available for dragging the timber up the bank, and the other the charges for elephant keepers and for the feed of the animals.

Seventh. The last column states the expenses of the sale, which in Rangoon were one per cent. on the amount realized by the same.

105. If it were our object to state the amount of net revenue obtained by the Forest Department, it would be necessary to take into account besides the items mentioned, also the salaries of the establishment and all contingent charges connected with the same. But as the present object is only to compare the proceeds of different modes of collecting revenue, which all require the keeping up of an establishment, we can dispense with a discussion on that portion of the expenditure.

106. It is, however, true that this mode of collecting revenue from the Government forests will, in future, require a considerably larger establishment. But the increase, which on this account ought to be charged against the timber of this year is not considerable, as only a few additional appointments have been made, in cases where it was impossible to carry on the work without them.

107. From Table VI. it will be observed, that the item for dragging and floating to the place of delivery forms more than $\frac{3}{4}$th of the whole expenditure. This is owing to the great difficulties which the dragging of timber to the water-way causes. The work is not only hard but unhealthy, and on this account the rates for dragging must always be heavy, although it is to be hoped that they may in time be somewhat diminished.

108. The most important result of Table VII. is, that the sum total of expenditure has been 35 per cent. of the amount realized in Rangoon, and 46 per cent. of that realized at Toungoo, the difference between these proportions finds its explanation in the comparatively low prices realized at Toungoo, compared with the high prices obtained at Rangoon. We may from this conclude that for the future the average amount of expenditure will be 40 per cent. of the amount realized.

109. It will further be remarked that whereas in Toungoo the expenses of every description of timber formed about the same proportion of the amount realized, viz. between 40 and 50 per cent., this was not the case in Rangoon, where it varied from 8 per cent. to 12 per cent. The reason of this irregularity is the fact that the rates paid for dragging and floating the timber to the place of delivery were in Toungoo different for each description of timber, whereas in Rangoon they were more of a uniform character. These more uniform rates for dragging etc. though very convenient, must, however, be considered as an exceptional measure. It was adopted because it could not be expected that the contractors, being without elephants, would be able to drag any but small logs from the forests, and that all large logs that they might bring down, would be found in or near the water-way and thus cause them comparatively little trouble.

In future most of the contracts to be concluded, will have rates similar to those of the Toungoo forests.

110. The comparison of the three modes of collecting revenue, as exhibited in Table VIII. shows, as regards the general result, the decided advantage of the working of the forests on Government account over both the other systems. It will, however, be observed that this advantage is not the same for all kinds of logs. For under-sized timber (Yatthits) there is no advantage or but a trifling one in favour of the present system, whereas for large logs it is very considerable. The latter fact is the only ground we have to hope for a continuance of this advantageous state of things; for the prices at present realized for timber in Rangoon are somewhat higher than those usually paid at Moulmein and can therefore not be expected to maintain their present height.

d. Clear profit realized.

111. Other circumstances will also contribute to reduce them to

a lower standard. The first is the yearly increasing import of foreign timber, generally of excellent quality, both by the Irrawaddie and by the Sittang. But instead of discouraging this import of foreign timber and the depression of prices that will soon be caused by the same, it appears to be the duty of Government to take such measures as may be in its power to improve also the state of the foreign forests and to prevent their wasteful working. The measure of substituting a uniform rate of duty on every log of foreign timber instead of the former *ad valorem* duty might serve to discourage the felling and exportation of young trees.

112. Besides this it is likely that the price of teak in general will rather decrease than increase, on account of the supplies that may soon be expected from other quarters. The teak-producing parts of Java have since the commencement of this century been covered with extensive Teak plantations, the produce of which must in time exercise some influence on the market. Further the hills and valleys in the interior of this peninsula are said every where to be covered with Teak forests. The timber from the western portion of the same has of late years been the principal source of the Moulmein timber trade. That from the eastern portion must sooner or later find its way down to Bangkok, and will not fail to have its influence on the prices.

113. A fall in the price of Teak would seriously diminish the advantage to be derived from under-sized timber, or even render the bringing down of the same a cause of loss instead of gain, but it would always leave a considerable advantage in favour of the full-sized logs. As long therefore as the latter constitute only a small portion of the supply available, a fall in the prices might render the present system even a losing concern.

114. But this unnatural proportion between under-sized and full-sized timber is only a transitory one; as soon as the greater part of the old seasoned timber shall have been removed from the forests and as soon as we succeed in working all the forests with elephants, by far the greater portion of the timber will consist of large pieces, and the sale of these will always secure a considerable profit on the operations of the Forest Department.

115. From Table VII. it appears that the average amount realized for each of the 3,610 logs sold has been rupees 10. Of these 2,182 logs were under-sized, which were sold at an average of rupees 6 per

log and 1,428 full-sized which on an average realized rupees 18 per log. In Moulmein the present market value of full-sized timber is from 15 to 20 rupees per log, which very well corresponds with the prices realized in the two sales at Toungoo and Rangoon.

116. It is probable, that the timber that is to be brought down within the next two years will realize on an average the same price as this year, viz. 10 rupees per log, but that the new timber which will come down in 1859, and the greater part of which will be full-sized, will on an average realize Company's Rupees 15. Deducting from these amounts 40 per cent. for the expenses of bringing down, etc. there remains for the next two years, as the probable clear profit of our operations, rupees 6 per log, and after 1859, rupees 9 per log, not taking into consideration the salaries of the establishment, &c.

117. These numbers have been taken for the calculations in Table IX. as regards the estimate of annual revenue to be expected in this and future years. From this table, it will be seen that we have every reason to hope that the net revenue from the forests will be steadily increasing, until all Teak localities in the province shall have been made available, but that after deducting the expenses for the establishment and contingencies, it is never likely to exceed one lakh and a half a year.

12. Reasons for contemplating the adoption of another system in future.

118. We have hitherto discussed the advantages of the system now in operation only, which for the present state of things is undoubtedly the most profitable system that could be selected. But it is to be hoped, that after a series of years it will be practicable with regard to the working of the forests, to confine the duties of the Forest Department to the three first operations viz. marking, girdling, and felling, and to leave the removal of the timber to the purchasers. This is the mode practised in most European forests. For a continuance this method will be found preferable, because it will free the Forest Department from the overwhelming amount of entirely heterogenous work, which cannot but curtail the time and attention that ought to be given to the proper duties of forest administration, viz. to the measures which must be taken for the preservation, extension and consolidation of the forests.

119. It is, however, quite as evident that for the present such a change would not be advisable, since it would, as the amounts

realized by the sale of the seasoned timber in the southern forests show, reduce the revenue from the forests by more than one-half. Government must therefore, as it were, be the pioneers of an improved working system and introduce into the country, as well as raise in it, a class of able foresters with the means of working the forests properly. When these improvements shall, to a certain degree, have been accomplished, when the relative difficulties and treasures of the different forest districts shall have become better known, and lastly, when the reputation of Rangoon timber, shall have been re-established, then may we expect that enterprising merchants will come forward, and availing themselves of the experience collected and the assistance prepared by Government, offer such prices for the seasoned timber in the forests as will secure the same or even a higher revenue than the present system. Thus the taking the forest work out of the hands of the mercantile community has been no arbitrary measure, they have only to offer prices higher than those the Forest Department by its own working can realize, and the removal of the timber, previously seasoned by the Department, may without danger be thrown open to their enterprize.

120. It would be useless now to enter into full particulars concerning the execution of those plans that must be reserved for a distant future; but as in the course of time this subject might easily be lost sight of, it may not be useless to state a few of the leading points that will have to be observed.

I. To sell to the highest bidder the permission to bring away the seasoned timber of a certain forest district, the purchase money to be paid before the working of the forest commences.

II. This permission to be strictly limited to the trees that have been seasoned by the Forest Department.

III. The permission to be available for two years only.

IV. A uniform rate per log, large or small, to be paid over and above the purchase money when the timber is brought down to the place of sale, and this rate to be for all forests the same, irrespectively of the district from which the timber is brought down.

V. All disputes between different purchasers regarding timber from different forests, to be settled by the Superintendent of Forests.

These five points being secured, the proposed change may, in time, be adopted without risk.

13. Expenditure of capital necessary for facilitating the working of the forests.

121. In the preceding discussions, one point has purposely been omitted, viz. the outlay of capital for carrying on the working of the forests on Government account. The outlay of capital for this purpose will be required—

1. In order to render the present timber depôts and places of sale accessible to purchasers, and to make the necessary arrangements for facilitating the drawing up and securing of the logs on the bank.

2. For the removal of obstructions in the water-courses by which the timber is to be brought down from the forests.

3. For works to facilitate the dragging of logs to the water-way from the forests. We begin with the latter point.

122. If the Teak forests of this country were compact masses, it would be worth our while to construct roads through them, and from the same to the water-way, in order to facilitate the removal of felled trees, and thus to render that part of forest work less expensive. But such a measure could be of no avail in our forests, where the isolated patches of teak are often miles distant from each other, and where in many cases single Teak trees scattered here and there among a multitude of other trees constitute what are called the Teak forests of Burmah. Road-building therefore, which in a European forest administration, forms an important item in the outlay of capital, can here, with a few exceptions, be only undertaken when, perhaps after the lapse of a century, the endeavours to consolidate the forests shall have been crowned with success.

123. A few improvements, however, especially in the hilly parts of the country, must be made, without going to the expense of building regular roads. I mean the clearing of tracks over the ridges of the hills, which, at least in the central Yomah range can generally be made available for dragging the logs to the water-way. To this might, in some cases, be added the bridging over of ravines which interrupt the way, without affording the advantage of a water-course and the smoothing of a slope down which the logs may glide into the river.

124. But the execution of most of these improvements must, at least for the present, be left to those parties who enter into contracts for bringing down the timber, not only because these parties will be better able to judge which improvements will be most useful for their particular wants, but also because they will be able to do such work

in the interior of the country, away from all habitations, at less expense than the Forest Department. In order to encourage them, however, to undertake such works, the Department must share the expenses. How this share is to be determined, is a question to be decided upon by future experience.

125. The opening of the obstructions in the rivers by blasting the rocks, or by removing those impediments that consist of dry branches, over-luxuriant vegetation, etc. demands a second outlay of capital and one not to be too long delayed. It will in a short time more than repay itself by the increase of the supply of timber, at present shut up by such obstructions.

126. Different from this, is the outlay of capital necessary for the Government timber depôts in Rangoon, Toungoo, and Prome. We have already mentioned above, the necessity of purchasing a number of elephants for drawing up the timber immediately after its arrival, and for arranging it systematically according to the different descriptions of logs. It is true that during the spring tides this work can be accomplished by men, but to manage the work in this manner, would create both loss and confusion. For the work of drawing up and classifying about 20,000 logs of timber cannot be done properly, if a few days only twice in the month can be devoted to this purpose; especially, as the timber generally does not arrive at the stations all the year round, but only from July to December.—The depôts in Toungoo and Prome only being required for the collection of timber from the different forests, for the purpose of rafting the same previously to sending it down to Rangoon, as well as for the purpose of keeping small quantities that are to be sold by auction, the outlay required for arrangements in these places will be very limited.

127. In Rangoon however, where the whole of the timber must be kept for months, and sometimes for a year or more, for the purpose of being sold, and where, if kept in the river, it would be exposed to the danger of being stolen, or driven to sea by the strength of the current, or attacked by the Teredo Navalis, arrangements must be made to secure the timber on dry ground. In order to facilitate the operations of drawing up the timber for security and dragging down the same for removal by the purchasers, it is necessary to slope the high bank of the river down to the level of the neap tides.

128. Further, roads must be built leading to the timber depôt,

and a road along the same, so as to render all parts of it easily accessible to the purchasers and to the servants of the Department. For the amount to be realized by the sales will, to a certain degree, depend on two circumstances: First, on the facility given to the intending purchaser for examining the timber before the sale and forming an accurate idea of the value of the lots to be sold.

Secondly. On the arrangements made for selling the timber of different descriptions, not promiscuously, but in lots, each containing but one kind of logs. The latter point is an innovation on the custom formerly prevailing at Rangoon. It is an arrangement, that requires some trouble and attention, but that, in the end, will amply repay itself. For when after the introduction of the new system, most of the trees to be felled shall be of nearly equal size, many circumstances will continue to render it impossible to bring down logs of one description only. In many forests the water-courses are so winding that no logs can be floated through them unless cut up into short lengths, and in others again, the distance which the logs must be dragged overland is so considerable, that to reduce their weight as much as possible, it will be found necessary to square the timber in the forests. The result of the sales, if the different kinds of logs are kept separate, will teach us, in which shape it is most profitable to bring down the timber from the different portions of the forests. But if the timber is to be put up on the bank not promiscuously, but according to a certain order and system, all parts of the timber depôt must be easily accessible at all seasons of the year, and this cannot be done without the construction of good roads.

129. The amount to be expended on works of this kind will never be a lost capital, not even if the time should arrive when a change of system should make Government timber depôts unnecessary. For those private parties who may then undertake the removal of the timber will require suitably situated timber depôts in the same places where the present ones have been erected, and the improvements already made on them, will very considerably increase their value.

14. Disposal of the timber.

130. We now proceed to discuss the last point of the first division of this report, viz.: the disposal of the timber. Private purchasers of timber for sale and for exportation, or for their own use, are either found in Rangoon and other stations on one of the principal

rivers, or in the forest districts themselves. The number of the latter is very limited, and should a demand arise among them, they must be provided for by special arrangements, the conditions being that they have to remove the timber from the forests themselves, and that they pay the average market value of the same, after deducting the expenses that would have been incurred in bringing the timber down to Rangoon (or about 40 per cent.) this is provided for in the forest rules in paragraph 19.

131. The demands from private parties at Rangoon, and at the stations outside of the forest districts, will be met by periodical public auctions, of which those in Rangoon will of course be the largest, and most important. In order to make the Rangoon sales convenient for the large timber merchants and exporters of timber, it is intended to hold the principal sales once a year, as soon after the end of the working season as possible, probably about the month of December. But to render a portion of the Government timber directly available also for people of limited means, for carpenters and other artizans, it is intended to hold a number of smaller sales in Rangoon at stated intervals throughout the whole year, perhaps, once in three months. At these smaller sales, the timber to be sold will be portioned in lots of only a few logs each.

132. Of other stations, Toungoo and Prome have, for the present, been selected for the holding of public auctions, and it is expected that this will be sufficient, as the stations situated above, viz. Mecaday and Thayetmyo, cannot be supplied out of any forests of the British territories, and as all stations below Prome or Toungoo on the Irrawaddie, or on the Sittang river, as Myan-Oung, Murgyee, Bassein, Henzada, Shoaygyeen, and Sittang town, can always obtain their supplies from Prome or Toungoo. An increase of the number of places where auctions of timber are to be held is, however, not impossible, should it be found necessary.

133. The public departments throughout the country require to be considered separately. Those in the districts above Rangoon cannot, as a rule, supply themselves at the Prome or Toungoo auctions, at which in general only a limited number of logs, sufficient for the local consumption, can well be put up for sale. They must therefore be supplied by special arrangements, and the prices to be paid be fixed according to the rates realized in Rangoon after deducting that

share which the purchasers may have taken in removing the timber from the forests.

134. Public departments in Rangoon, however, as a rule, should not be supplied in this manner, but should, like private parties be obliged to go into the market. This will undoubtedly be inconvenient for many public officers, who would prefer to select for Government use the best of the Government timber, but such a measure would endanger if not destroy all hopes of bringing Rangoon to what it ought to be, an important market for Teak timber. This can only be effected by rendering the yearly supply as regular as possible, and by taking care that the quality of that brought to market be found improving from year to year. It is evident that this object cannot be attained, if public departments are at liberty to supply themselves at their option, with the best portion of the yearly harvest, leaving only the timber of inferior quality to be brought into the market. Nor would this principle be economical, for the more steady the supply of good timber, the more steady will also be the number of customers from abroad, and consequently the higher the price realized. This, however, does not preclude timber being granted in cases of emergency to public departments out of the stores of the Government timber depôt.

135. We conclude these observations with a few remarks on cases where it seems advisable to grant Teak timber to private parties without payment, or in a manner different from that hitherto proposed.

136. Under the Burmese rule, timber for building zayats, Poungyee Kyoungs, bridges, and other works for religious or benevolent purpôses, was free from all taxes and dues, and the fact that under the present rule, in the interior it has been made impossible, and on the large rivers very difficult, to procure a supply of that timber which in their estimation is alone worthy of being employed for such purposes, is perhaps one of those privations to which the Burmese population of this country is most alive. A better opportunity could scarcely be found, to reconcile the minds of the people to the present forest laws, than the adoption of liberal measures in this respect. In common justice this liberality must be extended to Christian places of worship, and schools in the Kareen and Burmese Christian villages in the district. This measure together with its mode of execution is embodied in No. XIX. of the new forest rules.

137. There are in the forests, besides the timber that may properly be called logs, small scantlings in great number; these are partly the branches of felled trees, partly the remainder of large stems, out of which a small log has been cut, and partly the stumps left standing when the trees were cut down. These stumps, which often have a very considerable girth, are not seldom from 6 to 8 feet long, so that in a few cases they might even find a market in Rangoon.

Whenever it is possible to have these small kinds of timber brought to a place of sale, at an expenditure not exceeding the price to be obtained for the same, this will be done. The demand, however, for scantlings, short logs and crooks for ships and boats, (the latter being the produce of branches) will always remain a limited one, until the building of ships, or certain manufactures in wood, viz. that of shingles, &c. shall be a matter of greater importance in Rangoon, than it is at present. By far the largest portion of these small logs, however, must remain in the forest, although they are very injurious, since they serve to feed and to increase the jungle fires by which all forests are more or less often visited in the dry season.

138. It will, in many cases, be possible to clear the forests of all these scantlings, if according to the para. 18 of the forest rules, permits for one year are given, granting the right to bring away such scantlings from certain districts. Necessary precautions, however, must be taken to prevent the abuse of such grants. The want of such teak scantlings is at present very severely felt, especially in the Prome district by the Tikcokes, or the manufacturers of the lacquered Burmese trays, which is one of the most remarkable branches of industry in this country.

139. I will conclude this subject by mentioning, that there are in the mountains on the east side of the Sittang, tracts covered with Teak, which, judging from the description given by different parties, can, on account of the heighth of the mountains, never be made available for Government.

The Karcens who live in those tracts, are in the habit of using Teak for their buildings. In all such districts from whence the timber cannot under any circumstances be brought away, it will be advisable to permit the felling yearly of a certain number of trees for the use of the inhabitants.

140. We now arrive at the second part of this report, viz. at the discussion of the measures to be taken for the preservation of the forests, that is, for their protection against injuries. Teak in this country is exposed to injuries of the following kinds:

II. *On the preservation of the forests.*

1. From injudicious and irregular felling.
2. From the jungle fires.
3. From the practice of Toungya, or hill cultivation.
4. From different natural causes, as creepers and parasites, and from the shade of other trees.

141. We have in the first part discussed the system proposed for working the forests and have proved that its operations, if faithfully carried out, will not endanger their preservation. We may therefore now confine ourselves to the discussion of a few of the different kinds of *irregular* felling that must be guarded against in our forest administration.

1. Protection against injudicious and irregular felling.

142. It cannot be expected that in this country all unlawful felling of Teak will ever entirely cease.

But as the inducement to fell with the view of selling the timber, will be considerably diminished after the 1st of January, 1858, the injury to be feared from depredations of this kind will probably not be very considerable.

The temptation to fell Teak in order to build Kyoungs, zayats, bridges, etc. in the forest districts, or to remove the scantlings and small pieces with which the forests abound, for the purpose of manufactures, will be likewise diminished by the introduction of the liberal system of grants of timber for such purposes, already proposed in para. 136.

143. Further, numerous cases were observed on my tour, both by myself and my assistants, in which young Teak trees had been cut down or mutilated for no purpose whatever, but evidently only from a desire to do mischief. It may be hoped that the forest rules, which, if sanctioned, will invest the Superintendent with the necessary power to punish such violations on the spot, will make it possible in time to prevent such violation of the forests.

144. *The jungle fires.* Towards the end of the dry season, when more than one half of the trees are leafless, and the ground is covered

2. Protection against the jungle fires.

with dry leaves and parched-up grass, a number of accidental or natural occurrences very frequently cause an ignition of those dry masses. The unextinguished embers of a camp fire, a burning cheroot, or even the friction of two dry bamboos, occasioned by the wind, are the causes of such fires, that generally spread over large districts. Although they convert the dry covering of the soil to coal and ashes, they pass without doing much harm to sound trees of two to three feet in girth and upwards. Trees, however, that are not perfectly sound, for instance, that have some dry branches on them, or where the bark near the ground has fissures, which is not unfrequently the case with Teak,—such trees suffer serious damage from these jungle fires, and not seldom become hollow, or otherwise injured.

145. Greater still is the damage done to seasoned or Nathat trees and logs by these fires. For these are either destroyed or so much injured that they lose considerably in value, and not seldom does the traveller meet in the forests of Burmah with logs half consumed, or with burning trees, or with large heaps of ashes white as snow, the remains of valuable timber not removed in time.

The amount of Government property that is thus being destroyed every dry season, is very considerable; thus, when travelling through the Khaboung and northern Nawing forests, out of 1020 logs and Nathat trees observed within 6 days, not less than 578 were half consumed by fire, or at least rendered unfit to be brought to the market. Near Thabalah, not far from the northern frontier, from 3 to 400 large logs were observed a few years ago lying ready for removal. Year after year this valuable timber was seen diminishing in number from the jungle fires, and now the remainder, little more than 100 pieces, have been brought down for the Forest Department. The only remedy against this is immediate removal of the timber as soon as the tree has been seasoned and felled. Hence it is very important to engage such contractors as have sufficient means at their command, and who will exert themselves to remove the seasoned timber from the forests as soon as possible.

146. The jungle fires are further injurious to seedlings and small trees; although not in so high a degree as might be supposed. The blackened sticks that are left as the only remains of young Teak appear lifeless, still many revive, and even those that have been burnt down to the ground, not seldom bring forth a new shoot in the ensu-

ing rains. But even in these cases, the growth of young Teak is retarded for one or more years and rendered more difficult, as the quicker growing jungle gains time to oppress the young tree.

147. Lastly, the jungle fires, in a great measure, retard the increase and renovation of the Teak forests, by destroying an immense quantity of Teak seeds that cover the ground and might otherwise have germinated. It would be impossible to put a stop to these jungle fires. Under the Burmese rule a law is said to have existed, by which every person who wilfully set fire to the forest, or who even was guilty of neglect in extinguishing any fires already kindled, was severely punished. It is not very likely that the Burmese authorities have been able to maintain this law in all its force; and even if such were possible, the fires arising from natural causes could not be stopped without changing the climate.

148. It is fortunate, however, that these superficial jungle fires have also their good side. They, in a great measure, clear the forest of underwood, and not only greatly facilitate the visiting of the same, but while on the one hand they destroy a large number of Teak seedlings, they on the other facilitate the growth of those that survive, by keeping back the growth of bamboos and other underwood and thus affording light to the young Teak.

3. Protection against Toungya cultivation.

149. Far more destructive, however, is the influence which the system of hill or Toungya cultivation exercises over the Teak forests. In those districts that I have had an opportunity of visiting, not less than one-tenth of the whole area bore the marks of having been laid under Toungya cultivation within the last eighty years. It is true that a portion of these showed signs of returning to their original state of forest, but this process is one of very long duration, and is hardly ever completed within a shorter period than from 80 to 100 years.

150. The peculiarities of this mode of cultivation, as well as its injurious effects upon the Teak forests, have been fully discussed in the report for 1855, as well as in other reports on forests in India, for instance in that given by the Committee on the effects of the destruction of Indian forests, in 1852. For the practice of burning down the forest, in order to obtain one single harvest only, is not peculiar to Burmah; it is general in Assam and in the hills of Central India.

151. The points to which we shall have to direct our attention, in order to devise means as much as possible to protect the Teak forests against this destructive agent are the following.

I. *Felling.* Teak localities are generally preferred by the cultivators. It is difficult to assign a reason for this fact, except in their belief, that where Teak is to be found, the soil must be more fertile. Under the Burmese rule the younger Teak trees were cut down like other trees and the larger ones generally mutilated by the cutting off of their branches. The Government Notification dated 26th September, 1853, prohibiting the felling of Teak throughout the country, has in general discouraged parties from felling Teak for the purpose of Toungya cultivation; still transgressions of this order are not rare. I have myself on my tour found not less than twenty-five Toungyas, in which, on the whole, 270 Teak trees and Teak seedlings have been cut down. Most of these offences have been brought into Court and some of the perpetrators punished. It will not be difficult to put a stop to this practice throughout the country as soon as the superintendent shall have been invested with power to deal summarily with such cases. It is a remarkable fact, however, that the trees that have thus been felled for Toungya cultivation do not all of necessity die. Many stumps are found to bring forth vigorous shoots, that not seldom attain a marketable size, though they never appear to attain any great dimensions.

152. II. *Burning.* The effects of Toungya fires upon large trees, seasoned timber, and seedlings, or small trees, are similar to those of the jungle fires, only in a much higher degree. The difference between the two is, however, great: in one case only the thin layer of dry leaves and grass that covers the ground burns away, in the other large masses of cut bamboo, branches and trees cause a conflagration, that not seldom lasts longer than 24 hours and spreads itself with irresistible force over the neighbouring forest. It is therefore not to be wondered at, that even large and sound trees suffer considerably from the burning of Toungyas. I have several times met with patches of old Teak in places that had been under Toungya cultivation. The trees had an irregular growth, and showed unmistakeable signs that this was owing to their having been exposed to the Toungya fires.

153. One peculiar kind of injury caused by the formation of Toungyas is the over-luxuriant growth of the dense jungle that in

most cases immediately occupies the soil, fertilized by the large amount of ashes, and not yet exhausted by the single harvest it has yielded. This jungle renders the springing up of young Teak on a Toungya locality impossible; for young Teak never grows except when exposed to a certain degree of light. I have, in numerous instances, carefully examined the ground around Teak trees loaded with seed in Toungyas, and never found one single young plant. The growth of this dense jungle which, as it were, constitutes what may be called the first period after the field has been abandoned, goes on probably for about 40 years, until the second period commences, in which different species of bamboo gain the upper hand over the mixed jungle. The stems of bamboo generally die after having flowered and brought forth fruit, that is, after a period of from 10 to 20 years, which, according to an opinion common among the Burmese, is the time the bamboo requires for reaching maturity. At the end of this time, the decaying bamboo makes room for Teak seedlings, which now have a chance of success, and may constitute the beginning of a new forest if they succeed in getting the upper hand of the fresh crop of bamboos just about to replace the old one. To make this final return to a useful forest possible, arrangements have been made that no Teak tree standing in a deserted Toungya shall on any account be killed and removed. (Instructions, para. 5.)

154. We must, however, after describing the disadvantages of the Toungya cultivation system, not omit to state that in some respects it may also have its advantages. In the Prome district, on dry hills near the northern Nawing, the burning of the trees and shrubs for Toungya cultivation does not create a mass of low dense jungle as in the other parts of this country. There, on the contrary, the fertilizing influence of the ashes has another effect. An unusual abundance of young trees are found on deserted Toungyas, among which there is generally a due proportion of Teak. Hence a deserted Toungya in those places may, with some care, be converted into a very valuable nursery for Teak, and an attempt has been made to give practical effect to this idea, by encouraging the cultivators of Toungyas in that district *to sow Teak in regular rows with their rice and cotton.* The Teak, as it generally germinates after several months, will not impede the growth of their crops, and will greatly profit both by the fertilizing effect of the ashes, and also by the clear ground during the first year

after the harvest has been removed, which may permit it to make such progress as to enable it to compete successfully with other trees and bushes. This system, if it should succeed, may perhaps even be extended to Toungyas in other districts, where, however, a clearing of the dense jungle on both sides of the rows of young Teak will be necessary.

155. We have now to discuss the question, what principles are to lead us with regard to the Toungya cultivation, which, certainly next to the wasteful working of the forests, has been the greatest enemy of the Teak in this province. It appears that it has been found necessary in some parts of India, for instance in Mysore, to put a stop to all Coomree cultivation, which is identical with the Toungya system of Burmah. The adoption of similar measures in this country, so thinly populated and so over-rich in forests, would hardly be wise. Much, however, can be done to limit the evil effect this system is likely to have on our Teak forests. To prohibit the formation of Toungyas in Teak localities would be the most effective measure, and this would be no injury to the cultivators, since the space without Teak left for Toungya cultivation, would be more than ample for maintaining a population many hundred times larger than the present. But the prejudices of these people are so much in favour of Teak localities that, perhaps without reason, they would feel it a great hardship if they were entirely shut out from them.

156. It has therefore been thought proper to adopt the following special resolutions with regard to Toungya cultivation, which are contained in paras. 9 and 11 of the forest rules.

1. No Toungya to be formed on any spot of ground, on which stand any number of Teak trees exceeding fifty, large or small, seedlings included. The unequal size of the Toungyas, which varies from one to twenty acres is certainly a disadvantage to the application of this rule, but as it is generally the custom for every family to cut one Toungya only, and as it is also in other respects more profitable to cut them of large sizes, (so much so that not seldom several parties join in the cultivation of one Toungya only), it is not to be feared that by diminishing the size of their Toungyas, the effect of this rule will be evaded.

2. Should Nathat or seasoned timber or logs be found in a place selected for a Toungya or hill plantation, the men who intend working the Toungya, before doing so, must fell and remove the same to such

a distance, that the fire of the Toungya cannot reach them. The execution of this rule will entail so much work on the people that they will probably in most cases prefer to select another site, where they will not have this difficulty to encounter. We may thus hope that under the working of the new forest rules, the evil effects of the Toungya system on Teak will soon be considerably diminished.

We must add a few remarks with regard to the influence of Toungyas on the state of the country in general, especially in rendering it more or less healthy. We quote a passage from a report of W. C. Onslow, Esq. to the Commissioner of the Government of the territories of the Rajah of Mysore, that forms a portion of the report abovementioned, because it is particularly to the point, not only for the Coomree cultivation in Mysore, but equally for the Toungyas of Burmah.

"In these clearings, the primeval forest with all its beautiful "timber and valuable productions, has given place to a thick scrub of "noxious weeds and brambles containing nothing useful. It may be "supposed, that clearing the forest would make the country more "healthy; and so it would, if the clearings were more permanent; but "the forest is now destroyed only to be replaced by a thick jungle of "rank vegetation still more unhealthy than the forest which, being open "below, admits of circulation of air; but the scrub is a dense mass of "vegetation, and from bottom to top it is about 20 feet high."

157. The only improvement in this respect, may be hoped for from a gradual introduction of the custom of selecting those places for Toungyas in preference to others, that have a number of years, perhaps ten years ago, been laid under Toungya cultivation, and that are now covered with dense jungle. The principal reason why the cultivators object to this innovation is, that the dense jungle is more difficult to cut down than an open forest; but it is to be hoped that they will in time be brought to see their own advantage and by gradually complying with the new custom, prevent the constant extension of this unhealthy jungle, which is certainly one of the sources of the numerous diseases, that not seldom reduce or destroy entire settlements of the Kareen or Burman cultivators in the hills.

158. We now proceed to the discussion of the injury to which Teak in this country is exposed by different natural causes, especially through other plants.

4. Protection against injury done by other plants.

1. Creepers and climbing plants belonging to different natural families very frequently attach themselves to Teak trees. The stems of these plants, not seldom one hundred feet in length, as thick as the thigh of a man, but as flexible as a rope, wind round the trunk and its branches, and their luxuriant foliage not seldom surrounds and covers the whole crown of the trees so entirely that the developement of its leaves is thereby considerably hindered. The result of the attacks of these creepers is generally a stunted tree of slow and irregular growth.

a. By creepers.

159. It is easy to remedy this evil; to kill the creepers by cutting through their stems; but this remedy has one evil influence; the killed stems of the creeper give nourishment to fires, and thus not seldom cause the destruction of the tree, which otherwise might not at all have suffered from the fire. To a certain degree this can be avoided by cutting through the stem of the creeper so high that the usual fires cannot reach the dry remains of the same. It is however, evident, that this must render the operation far more expensive than it otherwise would be.

160. Destructive in a much higher degree than the creepers, are certain parasites.

b. By parasites.

The most frequent of Indian parasites, those that belong to the family of Loranthaceæ, of which the mistletoe is the well known representative in Northern Europe, appear never to attack Teak.

The more injurious, however, are those belonging to the class of Ficus (Njoungben) already alluded to in para. 41 of this report. Many birds are very fond of the fleshy fruit of this tree, and by carrying the seeds about contribute much to render this parasite so frequent a scourge of our forests. At first only a small plant is observed attaching itself round the trunk with its branched stem and the many branches of its roots. But within a few years the parasite surrounds the trunk entirely, with a net of roots and branches, and at last one branch after another having died away, only the dead trunk of the Teak remains, standing above the rich foliage of the Ficus. The parasite is so firmly attached to the trunk, that it is impossible even in a very early stage of its existence to detach it from the tree, and since it derives its nourishment principally from the substance of the trunk, the wood of the latter is deteriorated in

quality and even gradually consumed. The number of Teak trees which thus fall victims to this parasite is very considerable. Only one remedy remains, viz. to kill, fell and remove all trees as soon as they are attacked by it.

161. It is a very remarkable fact, that while our Teak has to contend with these natural disadvantages, the Teak forests in Java appear to be quite free from enemies of this kind.

This seems to confirm the opinion several times already alluded to, that Teak in this country labours under disadvantages to which it is not exposed in others.

162. But we must guard against a misconstruction of this fact. It would be wrong to conclude that because the tree has in Pegu to contend with more difficulties than in other countries, the produce of the forests (the timber) should therefore be of inferior quality. The difference between timber of the same species of tree, but grown in different countries, and even in different localities of the same country, or even from the same locality, but treated in a different manner, is certainly very considerable, and hitherto Rangoon Teak has not enjoyed the first reputation as regards its quality. The reason of this may either be found in the grain, or general anatomical structure of the wood, or in accidental causes, such as the age at which the trees are usually felled, the time of felling, the greater or less care with which the process of seasoning has been accomplished, and lastly, the size of the logs into which the trees are generally cut up.

163. The peculiarities in the general anatomical structure of the wood are the consequences of the natural influence of soil and climate over which we have no control; still, should it be satisfactorily proved that the wood grown in a certain soil, or in certain parts of the country was decidedly superior, that is, firmer and closer-grained, we should as much as possible try to extend the Teak forests already existing in such localities, and select them for our plantations. But improvements of the second point are decidedly within the reach of a well-regulated forest administration, and it is to be hoped that the measures taken, only to fell trees beyond a certain age, and at the right time of year, and to season them properly; and lastly, the encouragement which will every where be given to bringing down the logs as large as possible;—that all these measures together, will have some effect

in restoring the confidence in Rangoon Teak, shaken through former mismanagement.

c. By the shade of other trees.

164. We now proceed to discuss the injury which the shade of other trees exercises on the growth of Teak.

Young Teak, as has been rightly observed in my predecessor's last report, does not frequently spring up under shade. The great prevalence of other trees therefore over Teak is a great hindrance to the growing up of seedlings in sufficient quantity to replace those trees that have been removed.

165. Besides this, other trees not seldom stand so near to young Teak as to prevent their growing up straight, and attaining that stature for which the tree is justly prized. Against these disadvantages there is only one remedy, viz. the removal of the other trees that either directly impede the growth of Teak, or that by their shade prevent or retard the springing up of seedlings. This measure, however, if executed to any extent throughout the country, would entail an expense not warrantable, considering the insignificant revenue to be expected from our forests. For the trees must not only be felled, they must also be removed from the neighbourhood of the Teak localities, lest they should when dried up afford nourishment to the jungle fires, that might bring more destruction to the Teak than the measure would secure advantage.

Bringing to market the timber of other trees.

166. This can only be obviated by obtaining a price for the timber, sufficient to cover the expenses of its removal. Whether this will ever be possible in Burmah, where other timber is only now beginning to be used to any extent but cannot yet be called an article of trade, is a question which can only be settled by experiment. To give such an experiment, however, any chance of success, the following points must be observed:

I. None but trees of the best quality to be selected, and the logs to be cut in such lengths, as are likely to realize the highest amount combined with the least possible expense in removing the same.

II. The same care to be taken with this timber as with Teak, with regard to the process of seasoning and felling.

III. Only such trees to be selected, as stand near enough to the water-way to allow of their being removed without dragging them over long distances through the forest.

167. It would not be wise to extend this measure promiscuously to all the many kinds of trees that occur with Teak in the forests of Burmah. We must at first select those that are already to a certain extent in use, and for which a kind of demand already exists. At the same time it must be kept in view, however, that experiments on the qualities and strength of other kinds of timber may render it possible to add to their number. According to the present state of our knowledge the following trees appear especially to demand our attention.

1. Yndike, ... Dalbergia species.
2. Pynkadoe, ... Inga Xylocarpa.
3. Padouk, ... Pterocarpus species.
4. Shabin, ... Acacia Catechu.

These trees all belong to the class of Leguminosæ, their wood is of a red colour, and very remarkable for its hardness. Pynkadoe and Padouk are already in use to a great extent.

5. Oukchinya, ... Diospyros species.

A kind of ebony.

6. Eingy-yen, ... Shona robusta? Either identical with the Saul of India, or very nearly allied to it.

7. Pyminah, ... Lagerstrœmia species.

This wood is, next to Teak, at present most used throughout the province.

168. We now arrive at the last of the three principal portions of this report, viz. at the discussion of the question what can be done towards the improvement, extension and consolidation of our forests? We commence with a few remarks on the growth of Teak. Although this valuable tree is not wanting on any of the different kinds of soil that are to be found in the province, it is by no means on every soil equally remarkable for its fine and straight growth. The trees of the most perfect growth are to be found on the ridges and spurs of the central Yomah hills, on the soil of the *sandstone* of which these hills consist. Very fine stems are also often to be found on *light alluvial* soil, especially in the Sittang valley, and here and there also in the Irrawaddie valley. The trees on *laterite*, have stems generally much shorter and branching earlier, and those growing on *granite* or *trapp* are still inferior in stature, having often crooked and irregular trunks. The same disadvantage is sometimes observed

III. *On the improvement, extension and consolidation of the forests.*
1. On pruning.

in trees, that grow on *alluvial soil* in the plains, but whether this arises from a peculiarity of soil or from accidental circumstances, has not yet been determined. In such cases when the trees show a tendency to branching off too early, a judicious pruning in their youth might often be applied with great success, but judicious pruning is an art which requires long training, and therefore cannot be thought of for the present.

169. We go over to the other operations by which a general improvement of the forests may be effected.

2. Plantations.

I. *Plantations.* That planted Teak forests will succeed, if managed with proper care, ample experience in Malabar, Bombay, and especially in Java has proved. But it remains to be discussed, whether the timber raised in plantations will not be so much inferior to that grown naturally, that the propriety of expending large sums in the establishment of plantations may be doubted.

The general opinion in India appears to be *against* planted Teak, but this opinion is founded rather on general and theoretical ideas than on sufficient experience. It may be correct, that Teak grown in Bengal is less strong and valuable than that brought down from the hills of the Malabar coast or from the mountains of the Shan and Kareen country. But in the latter countries Teak is indigenous, whereas in Bengal it is only introduced, and grows under climatic and other influences totally different from those that surround it in its native soil.

The general opinion in Java is entirely the contrary of that in India, viz. *in favour* of planted Teak, and as Java is the only country where Teak raised in plantations has been employed to any considerable extent, we are justified in undertaking the cultivation of this tree on a large scale without fearing that we are only raising inferior timber.

170. It will, however, be necessary, not to undertake these operations at random, but carefully to select the places most suitable for the establishment of these plantations. The following points are to be observed in the selection.

I. Soil and all other circumstances must be suitable for the growth of Teak. It is therefore necessary to select the ground either near good Teak localities, or where Teak of good quality has formerly stood.

II. The place must be easy of access for Europeans at all seasons, and

III. It must be near one of the larger streams of the country, in order to render the removal of the timber to be raised in the plantations as easy as possible.

171. Localities possessing these advantages in a superior degree are to be found near the banks of the Irrawaddie. Above the stations of Myan Oung and Prome, the remains of the old Teak forest that has been described by the oldest travellers in this country, are here and there still visible near the river, for single trees and entire groups are left, affording sufficient proof that soil and other circumstances are favorable for the growth of this tree. Further, the communication, facilitated as it is by steamers and the neighbourhood of European stations, will render it comparatively easy to superintend the work on these plantations at all seasons of the year, and the immediate water communication with Rangoon, will reduce the expenses of bringing the timber down to the place of sale to a small amount.

172. In time, when the success of the Irrawaddie plantations shall have afforded an opportunity of collecting experience on this subject, and when a number of natives shall have been trained to their work, it will be advisable to establish similar plantations on the Sittang and the other principal rivers or their tributaries in the country.

173. The next point to be discussed is, how these plantations are to be established, and carried on. It cannot be expected that without any experience on this subject in a tropical climate, and with Teak especially, we should at present do more than give the outlines of the plan which for theoretical reasons and from the experience of forest plantations in Europe has the greatest chance of success, leaving the settlement of the details for the work itself and for further experience on the subject.

174. Our subject has two divisions.

I. Operations in the nurseries.

II. Operations in the forest.

I. Operations in the nurseries.

1. Selection of the nursery. The nursery ought to be situated in the midst of, or near to the forest. An open space should be selected of from 5 to 10 acres in size, not exposed to inundation; if possible surrounded by trees, and with single scattered trees on it. The soil ought not to be a heavy clay soil, but rather a light loam.

2. *Enclosure.* The whole nursery must be encircled with a ditch which must be kept clear from weeds and grass to protect the nursery from fire and cattle. The breadth of the ditch should vary according to the greater or less danger of that kind to which the nursery appears likely to be exposed. To render this protection more effective, a double row of plantations may be planted inside the ditch along the same.

3. *Preparation of the beds.* The whole nursery to be divided into long narrow beds with foot-paths between them. The beds to be raised from 6 to 12 inches above the paths. The beds to be composed of alternating layers of burnt turf, ashes, leaves and ground. The whole of this work to be completed before the rains commence.

4. *Sowing of the seeds.* About the commencement of the rains the seeds will be sown in rows about one foot distant from each other, very close together, as there is always a large number of them that does not germinate. The seeds must all be fresh, but they require no special preparation, as boiling in water or steeping in a hot solution of ashes. A number of experiments made this year has shown that this process does not enhance their germinating powers.

5. The beds to be kept clear of weeds, especially immediately after the rains.

6. *Removing of the plants.* One or, if necessary, two years after the seed has been sown, but always after the rains have fully set in, the seedlings to be taken up without injuring their roots, and to be carried in baskets covered with leaves to the ground where the forest is to be established.

II. Operations in the forest.

175. 1. *Selection of the grounds.* The nurseries are destined to furnish plants either for the establishment of new forests where little or no Teak is growing, or for filling up free spaces between isolated patches or forests of Teak. In both cases the nurseries must be close at hand. The grounds to be planted on must further not be exposed to inundation, although good Teak is sometimes found on ground that is now and then under water, they must not be covered with dense jungle or forest, and when this cannot be avoided, the jungle or forest must be partially cleared away, so as only to leave isolated trees standing, that shall afford a certain amount of shade, without depriving the young plants of light and air.

2. *Order of Planting.* The young plants are to be planted out in straight rows, the rows at a distance of nine to fifteen feet from each other, but the plants in the rows only at the distance of two to three feet from each other.

3. For the first five years, the ground on both sides of each row of young plants must be cleared of grass and shrubs once a year in December, so as to prevent the jungle fires from injuring the young plants.

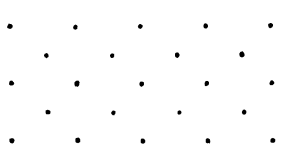
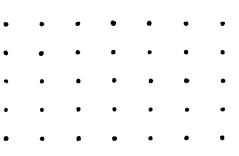
4. It is to be hoped that after that time the young forest, in which the trees will then have attained the age of 6 years will require no further care and expense, but that they will commence yielding a revenue through the thinning of their ranks, and the cutting out of entire rows, after the trees have attained such a size as will render this operation necessary.

176. The method here proposed is similar to the old German system of "Reihen Pflanzungen" (plantations in rows) as revised and improved by Mr. Biermanns near Aix-la-Chapelle, one of the most intelligent German foresters. The results of its application throughout Germany and in some forests of Switzerland have been most remarkable, and it is to be hoped that, with the modifications here adopted, it will also succeed in Burmah. The principal advantages of this system over any other are:

I. The raising of very strong seedlings in carefully prepared beds.

II. The placing them near to each other in rows, so that the young plants of one row are enabled in a short time entirely to cover the ground between each other with their foliage, and thus to keep down the growth of weeds and underwood.

III. The keeping of the rows far apart so as to afford the plant ample space on two sides for extending their foliage. This arrangement affords to those trees that have a stronger constitution than the others, ample opportunity to develop their foliage, at the expense of the weaker ones, and to gain a proper ascendancy over them. Any other system, that places the trees at an equal distance from each other, on all sides, for instance,

the *quincunx system*	or the *square* system
	

does not permit trees of a naturally stronger constitution than the rest to develop themselves freely on account of their being surrounded on all sides by other trees.

IV. It renders the selection of the trees to be taken out when thinning, easier, so that in a great measure this operation may be left to subordinates. The principle of thinning in this system is: to cut out the weaker trees only, but never to permit the distance in the rows between two trees left standing, to exceed a certain length.

177. The outlay for these proposed plantations will undoubtedly be very considerable in this country, where the superintendence will always be expensive, and the labourers neither cheap nor efficient. To this must be added the greater amount of labour which the weeding of the nurseries will entail, as well as the necessity of keeping the ground clear for the first five years, near the young trees transplanted into the forest. Although it is impossible with any degree of correctness to venture an estimate, I may say that 1000 trees that have reached the age of 6 years will probably have entailed an amount of expense ten times as high as what it would be in Europe. Whether this outlay of capital, together with the interest that will have accumulated on the sum before the forest can commence giving any revenue, can ever be expected to repay itself with profit, is a question which six years hence we shall better be able to determine than at present.

178. In order therefore not to incur any considerable risk, it will be necessary to limit operations of this kind for the first six years to two or three forests to be established near the Irrawaddie, each covering one square mile. Taking into consideration the amount of young plants that will perish from one cause or another, each of these forests may be expected in 1863 to contain about six lakhs of young Teak trees, and to have entailed an expense of about Co.'s Rupees 45,000. The state of these forests at that time together with a more complete knowledge of the rate of growth of Teak, and the greater experience gained in the working of the forests, will then enable us to judge, whether it will be advisable to extend these plantations or to establish others in other parts of the country.

179. It is possible that in time it will be found advantageous in our plantations to a certain degree to imitate the forests of Burmah, in which Teak is almost always found to associate with other trees.

But these mixed plantations cannot be undertaken before we have collected sufficient experience on the following questions.

I. Which trees are most adapted for growing with Teak, without injuring or hindering it?

II. Which of these are likely to realize the greatest amounts by sale of their timber?

The latter point will be answered by the results of the intended operation mentioned in para. 166. In order to obtain experience regarding the former point, certain reserved districts will be treated in a peculiar manner. In some of them Pynkadoe trees, in others Toukyan, in others other kinds of trees will be left standing together with Teak, and the more or less satisfactory state of these reserved districts, as regards the growth of Teak and the springing up of Teak seedlings, will teach us which trees are best suited for growing with Teak.

3. On nurseries in Toungyas.

180. Another mode of increasing the Teak in our forests by plantations has been alluded to above, in para. 157, when discussing the question relative to making the system of Toungya cultivation serviceable to the forests. The reward offered for the present to those cultivators who are willing to plant Teak in their Toungyas is very high, viz. Rupees 100 for 1000 healthy Teak plants standing in rows on a deserted Toungya. Should the experiment succeed, the price would have to be lowered.

4. On the throwing out of seed in cleared portions of the forests.

181. We now proceed to the discussion of a more simple, less expensive, but also less effective mode of extending the Teak forests of this country. This is by throwing out Teak seed on ground near Teak localities, but destitute of this tree. Two points will here have to be observed.

I. The ground on which the seed is to be scattered, must either be tolerably clear, or a portion of the trees and all underwood must be removed from the same; otherwise the seedlings that may spring up will only have a limited chance of success.

II. Every practicable measure must be taken to keep the jungle fires out of these localities, or at least to render their effects less destructive.

The latter will only in rare cases be possible, for to intersect the country with ditches, would entail too great an amount of expense

and would cause great inconvenience in the removal of timber. But towards the former much can be done, by taking care that no dry timber or brushwood accumulate.

182. We now arrive at the last point under consideration for the improvement of the forests, viz. at the measures that are to be taken for their consolidation. All measures and operations discussed in the preceding paragraphs will, to a certain degree, be either direct or indirect preparations for this one great object, the importance of which requires only to be alluded to. The great drawback of our Teak forests is the fact repeatedly mentioned in all reports of my predecessor as well as in the preceding pages, that Teak scarcely ever occurs in compact masses, but only here and there, scattered in a forest of other trees.

5. Consolidation of the Teak forests.

183. It is this peculiar feature of our forests that renders the working of them so expensive that the actual cost of bringing down the timber forms the unheard-of proportion of 40 per cent. of the amount realized.

It is this that renders all hopes of improvement in this respect illusive, for what could the advantages of a road be, that, after many miles, reaches at length only a group of a few hundred Teak trees, then goes on a mile further until it meets a few more, and at last makes a circuit of several hundred yards to find one solitary Teak tree.

It is this that renders the protection of our forests against robbery impossible, except by establishing, in the full sense of the word, a monopoly of Teak timber.

It is this that renders every measure for the improvement of the forests so doubtful in its success, as it is necessary to travel from 50 to 100 miles before the locality is reached where the work is to be inspected.

The fact that the 500,000 full-sized Teak trees of the Pegu forests are scattered over an area of more than 7,000 square miles will render it necesary to employ for the protection and management of these forests several hundred Goungways and other subordinates, whose salaries will consume another 17 per cent. of the amount to be realized by the sales. In short, this fact is the great impediment to an advantageous forest administration in Pegu.

184. Preparations therefore must be made, gradually, to introduce changes in this respect, and to bring the forests into a more

consolidated state. It is true that we shall not live to see or reap the fruits of such measures, nor is it likely that the next generation will do so, but this is the fate of almost every measure in forest administration, and it would not be wise to desist from all attempts at improvement, because their result cannot secure immediate advantages.

185. The general measures to be taken for the consolidation of the forests are of two kinds.

I. Gradually to change into pure Teak forests those localities where Teak forms a considerable portion of the forest.

This will be effected by removing a portion of other trees and all underwood and thereby giving the Teak greater facilities for multiplying itself. The particulars of this measure have already been discussed in para. 165.

II. To fill up with young Teak trees the space between different patches of Teak forest. This can be done either by adopting the mode of proceeding in para. 181, or by establishing regular nurseries and plantations.

186. It is evident, that in order to enable us to expect important results from these operations, they must not be executed at random here and there, but according to a fixed system, in one or a few forest districts only at a time. At first it will be more advantageous to select such districts for the carrying out of these measures, as shall offer the smallest amount of difficulty. One of the most suitable is the lower part of the Thoukyagat district. This forest district is situated on both sides of the Thoukyagat stream, one of the larger Eastern tributaries of the Sittang. Its lower end is only 5 miles distant from this river and from the town of Toungoo; every facility therefore exists both for supervision and for the bringing away of the timber. Even the dragging from the more remote portions of the forest is comparatively easy, as several of the feeders of the Thoukyagat stream are capable of floating timber in the rains. Further, the Teak in this district has upon the whole a good growth, and is comparatively abundant, and those portions in which Teak forms a considerable proportion, are numerous and not very far distant from each other. The length of the point in question is about 8 miles, and the breadth varies from 2 to 4 miles, on this area of about 24 square miles are about 2,000 I. class trees, or eighty-three on a square mile, which is a very fair proportion.

187. This district therefore is in every respect well suited for the execution of the measures mentioned above, and it is intended to commence them as soon as the removal of the seasoned timber from the Toungoo forests, which at present must occupy the undivided attention of the forest assistant there, shall to a certain extent have been completed.

188. The first operation in this and similar cases will be the making of a map of the whole district which it is intended to convert into one continuous Teak forest. After this, certain localities must be marked out in the district, viz.:

I. The paddy fields and other ground actually under cultivation or likely to be cultivated in the neighbourhood of the villages in the forest.

II. Those localities in which Teak forms an important portion of the forest and which are suitably situated for being converted into pure Teak forests, and as it were for forming the centres from which the work of consolidation is to extend in all directions.

III. Such places, situated near to those mentioned under No. 2, as appear suitable for the establishment of nurseries and planted forests.

IV. Those localities where a mere scattering of the seed appears sufficient.

After these preparations, the work can begin in the localities mentioned under Nos. 2, 3, 4, in the manner already described.

189. It is, however, evident that, to avoid serious injuries to these operations, those localities marked out under Nos. 2, 3, 4 must be placed under the special control of the Forest Department, so that no Toungya is to be formed in them, and that even the felling of other trees than Teak for other purposes must be placed under the control of the Forest Department. In order to enable the superintendent and his assistants to give due effect to such arrangements, it has been fixed in the forest rules (para. 13,) that in districts that may be declared reserved districts, no other trees besides Teak are to be felled without permission, which of course excludes all possibility of Toungya cultivation in the same. The maximum size of 10 acres fixed for such reserved districts in the forest rules will in most cases be sufficient, and where this is not the case, their dimensions can be extended by order of the commissioner.

190. About six years after the operations now discussed shall have been commenced in one series of reserved districts, at the time when the young plants are independent enough no longer to require any care, a second series will be laid out and operations commenced in the same. This gradual and periodical mode of proceeding will prevent the overloading of the market with the other trees that must be felled and removed in order to make room for Teak. It will further make it possible to accomplish the greatest amount of work, viz. the commencement of the operations in those years in which no working of the forests in that division is being carried on. It will render practicable the increase of the allotment of ground for cultivation to each village if such should be found advisable, and lastly it will enable us in time, in a greater measure, to profit by the experience which will have been collected during the early stages of the operations.

191. Whatever modifications and improvements, however, in the particulars of the operations it may be found advisable in the course of time to adopt, the general plan for the consolidation and the improvement of the forests, as proposed in the preceding pages, must, if once put into practice, be strictly adhered to until a long experience shall have proved that is was based on erroneous suppositions. Even in agriculture a frequent change of system is injurious, although there the cultivator has mostly to deal with plants whose life does not extend beyond one or two years. How much more injurious is it in the cultivation of forests consisting of trees that do not reach their maturity in a period much short of a century. It is a complaint frequently heard from foresters in Europe that the forests in this or that district are going to ruin, because the system of administration had not been carried out as it had been commenced. It is a true saying therefore that, in forestry, the laying out of plans and the commencement of operations is easy, but that a steady adherence to the plan laid down is a very difficult task.

D. BRANDIS,
Superintendent of Forests in Pegu.

Office of the Superintendent of Forests in Pegu,
Rangoon, the 16th December, 1856.

B.

NOTIFICATION.

All parties who may own Teak timber, lying within the Province of Pegu, below the forest limits as fixed in the Government Notification, dated 30th May, 1854, and 9th November, 1855, are hereby informed, that such timber, if intended for sale or exportation, must be passed at one of the Timber Revenue Stations, viz.: at Prome, Toungoo, Kemendine, or Puzoondoung, before the 1st of January, 1858, as after that date no Teak timber grown within the limits of the Province of Pegu will be passed at any of the stations above mentioned.

By order of the Commissioner of Pegu,
and Agent to the Governor General,
D. BRANDIS,
Superintendent of Forests, Pegu.

Rangoon, the 20th October, 1856.

C.

RULES FOR PRESERVING THE FORESTS IN PEGU.

I.—The forests of the Province of Pegu being the property of Government, the following rules are published for their conservation, and in order to ensure success for the measures taken for their future extension.

II.—The officers appointed for the administration of the forests are

1.—The Superintendent,
2.—Assistants in districts,
3.—Goungs and Goungways in forest tracts.

III.—No person is permitted to girdle or to fell any Teak tree, large or small, except by the express orders of the Superintendent, or his assistants.

IV.—No person is permitted to cut or break off the branches of Teak trees, or otherwise injure them.

V.—Other trees beside Teak which may have been girdled by order of the Superintendent are likewise neither to be felled nor removed, except by orders from the same officer.

VI.—The felling, or dragging of trees, which any person may be permitted to remove from the forest, must always be done in such a manner as not to break or injuire any Teak trees.

VII.—No person shall remove, or cut in pieces, or otherwise deface any Teak log lying within the boundaries of any forest, except by order of the Superintendent.

VIII.—No person is permitted to set fire to any Teak timber standing or felled.

IX.—Should therefore Nathat or seasoned timber or logs be found in a place selected for a Toungya or hill plantation the men who intend working the Toungya, before doing so, must fell and remove the same to such distance that the fire of the Toungya cannot reach them.

X.—In the case mentioned (in No. IX.) no special permission is required for the felling or removing of Teak timber to form Toungyas; but information must be given of this having been done to the nearest Goungway, who is ordered to visit every village in his district soon after the rains.

XI.—No Toungya is to be formed on any spot of ground on which stand any number of Teak trees exceeding fifty, large or small, seedlings included. In special cases the Superintendent or his assistants may grant permission for Toungyas to be formed in such spots where it appears to them that the Teak trees cannot be made available for the use of the Forest Department.

XII.—Nurseries or plantations, formed by order of the Superintendent of forests, are not to be injured in any way.

XIII.—Whenever the Superintendent, or his assistants, may think it fit to reserve any tract in the forest, no tree, shrub, or dead timber in the said tract is to be injured, felled, or removed, except by the servants of the Forest Department. No tract of a size exceeding ten acres is to be thus reserved without the special sanction of the Commissioner.

XIV.—Whenever the Superintendent of Forests or his assistants, may find it necessary to mark trees of any kind with the Government mark, such trees are neither to be cut nor injured in any way.

XV.—Poles, or other signs, put up to mark the boundary of a reserve tract, or for other purposes, likewise sheds, bridges, fences or buildings of any kind, together with roads and ditches erected

or made by order of the Superintendent, are not to be removed or injured in any way.

XVI.—It will be the duty of the forest Goungs and Goungways to see that these rules are not violated, and should they in any case be infringed, to report the same to the Superintendent or his assistants.

XVII.—Private parties, in the districts near the forests, and at a distance from the principal rivers, who may be desirous of purchasing Teak timber for their own use in the district, may obtain the same by applying to the Superintendent. If the application can be granted, orders will be given to the forest Goungways to point out the trees or logs available for the purpose. The purchasers will have to fell and to remove the timber within a fixed time. The price to be paid for the same will be settled by the Superintendent, and one fourth of it is to be paid before any timber is felled. If the timber be not removed within the time specified it will be liable to be confiscated and the amount paid in advance to be forfeited.

XVIII.—Permission to bring away branches of felled trees or other small pieces of timber such as slabs cut off from squared logs, or the stumps remaining after the tree has been felled will be given to parties applying for the same on their depositing a certain sum as a security, and on payment of a fixed price for one year's grant in one forest district. The grant, however, as well as the deposit, will be forfeited in case the parties bring away or destroy any timber besides that stipulated for.

XIX.—Parties residing in the districts near the forests, and at a distance from the principal rivers who may be desirous of obtaining Teak timber for the erection of buildings for religious purposes or the common benefit of the public, as Christian churches or chapels, schools, kyoungs, zayats, bridges, &c., may apply for the same through the local authorities to the deputy or assistant commissioners of the province. The latter, in case he finds it advisable to recommend the application, will forward the same to the Superintendent of Forests, who will decide whether any or the whole of the timber required can be given out of the Government forests. The applicants, to whom the timber available will be pointed out by the forest Goungways will be required to fell and remove the same to the place where it is to be used, within a fixed time. Timber for these purposes will be given gratuitously; but on the expiration of a year from the time of timber

being made over to the parties, an account will be called for by the Superintendent of Forests, showing how it has been used. Should it not have been applied for the purposes specified in the application, he will be at liberty either to take possession of the timber, or to impose a fine on the parties concerned equal to twice the average market value of the timber.

XX.—Any person who infringes any provision of the forest rules, or any subordinate of the Forest Department who wilfully neglects his duty, will be liable to fine not exceeding two hundred rupees, and on default of payment to imprisonment for a term not exceeding six months without labour. In cases where the infringement involves theft of timber, the offender will be liable to be proceeded against in the Criminal Court.

XXI.—All cases of violation of the forest rules may be tried and decided by the Superintendent of Forests, either by personal enquiry into the facts, or on the record of enquiry made by a forest assistant. In any case the decision, and the grounds for it shall be recorded, and the same will be open to appeal to the Commissioner.

XXII.—Whenever a person is sentenced to fine and in default to imprisonment, by the Superintendent of Forests, the person so sentenced shall be forwarded without delay to the officer in charge of the district within which the offence was committed, together with a copy of the sentence, and the said officer shall forthwith proceed to execute it.

(Signed) A. P. PHAYRE,
Commissioner of Pegu and Agent to the Govr.-General.

Pegu, Commissioner's Office, Rangoon,
The 21st October, 1856.

D.

GENERAL INSTRUCTIONS FOR THE OFFICERS CHARGED WITH CONDUCTING THE OPERATIONS OF MARKING AND GIRDLING DURING THE DRY SEASON OF 1857.

Marking.

1. Throughout the whole district every accessible tree of the first class, or measuring in girth six feet and upwards, is to be marked.

2. One-fourth of all trees marked according to para. 1, are to be girdled.

Girdling.

3. In those districts that may be assigned as districts impossible to work no trees are to be girdled, but all first class trees are to be marked.

Exceptions.

4. In those districts that may be assigned as reserved forests, no trees are to be girdled except those mentioned in No. 6, but all first class trees are to be marked.

5. No Teak tree standing in a deserted Toungya, or on the margin of the same, is to be girdled, but all first class trees are to be marked.

6. Trees standing alone, or so far from others that by taking them away the ground around them would be deprived of seedlings, are not to be girdled.

7. All trees that are beginning to be Nathat; either because attacked by parasitic plants of the Ficus family (Njoungben), or from other causes, are to be girdled without exception.

Additions.

8. If among a number of Teak trees, some stand isolated and others in groups, the trees first to be girdled are to be selected from among the latter.

Selection of the trees to be girdled.

9. Trees that overshadow small Teak trees or seedlings, so that they hinder the latter in their growth, are to be girdled in preference to others.

10. Trees that are hollow, or that show other signs of decline, are to be selected in preference to those that are perfectly sound.

D. BRANDIS,

Superintendent of Forests in Pegu.

Office of the Superintendent of Forests in Pegu, Rangoon,
The 16th December, 1856.

E.

MEMO. ON THE TEAK IN THE THARAWADIE DISTRICT.

(Written at the request of the Assistant Commissioner, Tharawadie District, in June, 1856.*)*

Teak trees, though scattered and of inferior growth, are not uncommon in the lower parts of the Tharawadie district. The forest at

Tahpoon, the Teak near Minhla-yoah and that below Leppadan on the Beeling are the nearest to the upper Hlaine or Konktleau river that I have observed.

2. The Tahpoon forest, which is one of the few forests in this country in which Teak prevails over other trees, contains about 150 trees of 6 feet girth and above, but a very large number of smaller trees. We cannot at present expect any timber of great value from this forest, because the growth, on account of the early branching of the trees, is very crooked. Yet I am not without hopes of remedying this in time. The "royal forest" at Emmah in the Prome district almost exclusively consisting of Teak, and not more than 30 miles distant from Tahpoon, is situated on similar soil and is, like it, in the lower part of the plains. It contains about 1300 trees above 6 feet girth, almost all of which are as straight and tall as the finest Teak on the sandstone hills of the Yomah range. There are further many extensive Teak forests in the Sittang valley, situated equally distant from the hills and in similar soil with that of Tahpoon, still the Teak in them grows straight and tall. I wish therefore to try in this place, whether the trees will not obtain a better stature, if made to grow up closer to each other.

In order to effect this I intend trying two methods. In one part of the forest the whole of the underwood and most of the other trees will be cut down and removed, in order to afford light and space for young Teak to spring up of itself.

In another part a large number of young plants will be planted out, which are to be reared in nursery beds on one of the clearings of the forest.

In order to carry out these measures an active and intelligent Goungway will be required at Tahpoon. He might in time also be taught how to prune trees, and thus further assist in the improvement of the forest. The Tahpoon forest is one of the few that I have seen in Burmah where pruning seems to be called for.

3. Near Minhla-yoah scattered Teak commences almost as soon as the low ground ceases, which surrounds the Lahakin marsh. Near the north bank of the Minhla-choung, about one mile below Minhla-yoah I have observed a small number of Teak trees, but many more are in the forest between the latter place and Taijmyouk on both sides of the Minhla-choung. This is a part of what is called the

twelve village forest (Tah-sai-nayoahtan) once a rich source of fine timber, but now reduced to a forest of Teak stumps intermixed with other trees. These stumps are often from 8 to 10 feet high and have a girth of 10-15 feet. Large branches and the remains of fine large stems, which had been converted into small logs, were also lying about every where, often half destroyed by fire.

Of standing trees we observed near our path 40 trees below and 10 trees above 6 feet in girth. The other trees are those common in the mixed forests on high ground the more prevalent were Pynkadoe, (Inga Xylocarpa), Toukyan (Pentaptera species). Here and there patches of Eing forest (of Diptero-carpus species) change the character of the forest, without excluding Teak, however, in all cases.

4. The third forest which I have visited in the lower parts of the Tharawadie district, is of much less importance.

On the road from Leppadan to Sanjouay, young Teak from 5-10 years' growth abounds. The soil and other circumstances are very similar to those in the Tahpoon forest. Besides the young trees, 14 under-sized and a few full-sized trees were observed near the road.

5. A second and far more important line of Teak forests skirts the foot of the hills. There is a broad belt of Eing forests from north to south extending through the whole length of the district. This probably forms the connection between the Eing-dein of the Prome and Meaday district, in the north, and that of the Thoungyai between the Hlaine river and the hills in the south. But the Eing forest is not without interruption. Patches of mixed forest, of other trees with a considerable proportion of Teak occur frequently, especially near the margin, and sometimes in the heart of the Eing-dein. There is then the second region of Teak forests, which, varying in breadth from one to ten miles, covers the low undulating hills between the higher ridges of the Yomah and the Eing-dein. This Teak region I have visited between the Mokha and Minhla-choung and for about 4 miles to the north of the latter.

The following are the numbers of trees observed by me.

1. North of the Minhla-choung, 3rd May, 1856.

I. Class trees,	185	(one of 16′ 9″ girth two of 11″ girth).
II. Class trees,	202	
III. Class trees,	368	
Nathat trees,	12	
Logs and seasoned trees,	35	(one of 19′ 5″ girth).

2. South of the Minhla-choung between Saiyoah and the hills 6th May.

I. Class trees,	32
II. Class trees,	160
III. Class trees,	100
Nathat trees,	40
Logs and seasoned trees,	53

3. South of the Minhla-choung between Saiyoah and Ronnejona, 7th May.

I. Class trees,	106
II. Class trees,	150
III. Class trees,	150
Nathat trees,	70
Logs and seasoned trees,	230

These numbers prove that these forests, the timber of which can, without great difficulty, be dragged either to the Minhla or to the Mokha-choung, are still very rich in full-sized trees and promise a good supply for the future. That they have been formerly much richer, is proved by the almost countless numbers of stumps, large and small, not only where Teak is still standing, but also where at present no tree is to be found. A large number of the trees had evidently been cut down during the rains of 1855, and many logs had been squared only a few months before I visited the forest. In one place we found 7 fine trees of about 5 feet girth fresh girdled with their leaves and young shoots still on them, but perfectly dry. These had probably been killed soon after the end of the rains, before the fall of the leaves, in hopes that the time for bringing away "bonâ fide private timber" would be extended beyond the 1st of January, 1856.

It was interesting to see the temporary houses, which the men of several of the neighbouring villages had erected in different parts of the forests, for themselves and for their buffaloes, while working there. I counted 4 such transitory villages, each consisting of from 6 to 8 houses, with stables and out-houses.

The trees which accompany Teak in these forests are the usual trees of mixed forests on high ground, Pynkadoe and Toukyan being the most prevalent.

6. Much finer, because less devastated, are the forests on the ridges and spurs of the higher hills. I have spent two days on these

hills, and on both days penetrated in different directions to a distance of about 8 miles in a straight line from their foot. At first the stumps are very numerous, but always accompanied with fine and straight under-sized trees; further in the interior, stumps disappear and trees of large girth increase in number. Teak is, however, at present by no means uniformly distributed over these hills. Wherever Karcens with Toungya cultivation have had their settlements, Teak has almost entirely disappeared. The numbers of trees, observed on these hills, will prove this fact.

On the 4th of May I examined the hills north of the Minhla-choung, where but few or no Kareen settlements had been established. In one place only we met with the traces of a deserted Toungya. In a walk of 9 hours we counted:

I. Class trees, ...	248 (of these 31 above 7 ft. 6 in. girth).
II. Class trees, ...	385
III. Class trees,.....	488
Nathat trees, ...	50
Logs and seasoned trees, ...	84

On the 5th May we went over the hills south of the Minhla-choung. Toungyas have been very frequent here, On a march of 12 hours we met with the following number of Teak trees.

I. Class, ...	110. (of these 8 above 7 ft. 6 inches in girth.)
II. Class, ...	305
III. Class, ...	240
Nathat trees, ...	40
Logs and seasoned trees, ...	40

The soil and other circumstances are similar to those on the north side and where Toungyas have not been found, very fine trees may be observed. There is for instance one beautiful spot, where 9 magnificent trees stand close to each other in a space the circumference of which is only 150 feet, so that their average distance is not more than 12 feet.

The appearance and the value of the Teak forests on these hills is very much the same as on the other parts of the Yomah mountains. The soil is the same as that on the hills between the Khaboung and Nawing, or on the mountains near the upper Koon or Phyoo-choungs.

It is always the grey Yomah sandstone alternating with layers of bituminous clay, only here and there interrupted by masses of trap on the top of the ridges. This soil always remarkable for the fine, tall straight growth of Teak upon it, does not here lose its character. The trees on the higher hills near Saiyoah are decidedly more perfect than those on the lower undulations between the hills and the Eing-dein.

It would, however, be wrong, to pronounce the forests on the Tharawadie hills *superior in value* to those in the plains; for the difficulties of dragging the timber into the water-way may be said to increase in a direct ratio with the beauty and abundance of the timber. But these difficulties must in time be overcome, and then the Yomah mountains, it is to be hoped, will prove a rich source of timber which may, as regards its quality, stand a comparison even with the large and beautiful logs that at present are being brought to Moulmein in such abundance from the countries of the Shans and the Kareens.

(True Copy)

D. BRANDIS,

Supdt. of Forests in Pegu.

Office of the Supdt. of Forests in Pegu, Rangoon,
The 16th December, 1856.

F.

TABULAR STATEMENTS.

Table 1.

Tabular Statement shewing the quantity of Green, Nathat and Seasoned Trees and Felled Timber observed in four districts, during the latter part of the Superintendent's circuit through the Forests in 1856.

Name of Districts.	Green Trees. I. Class. Measuring 6 feet in girth and above.	Green Trees. II. Class. Measuring 4 feet & 6 in. in girth and above.	Green Trees. III. Class. Measuring 3 feet in girth and above.	Nathat trees.	Seasoned trees and felled timber.	Total of Nathat, Seasoned and Felled timber.	Remarks.	
Khaboung, ...	1,296	480	...	...	...	545	In 6 days, number of logs observed, ...	442
							Ditto of logs observed half destroyed by fire,	578
							Total No.	1,020
North Nawing, ...	284	738	...	...	...	542	In 1 day in the Nawing, trees of I. Class observed, ...	29
Khyoungzouk, ...	162	83	...	...	...	228	Ditto ditto of II. Class ditto, ...	40
							Ditto trees below 3 feet in girth and seedlings ditto, ...	500
							Total No.	569
Minhla & Mokha, ...	681	1,202	1,346	212	442	654	In 2 days, in the Minhla and Mokha forests, observed trees between 6 feet and 7 feet 6 inches in girth, ...	289
							Ditto above 7 feet 6 inches ditto, ...	38
							Total No.	327
	2,423	2,503	2,793*	640*	1,329*	1,969	* These numbers were obtained by calculation.	

Office of the Supdt. of Forests in Pegu, Rangoon, The 16th December, 1856.

D. BRANDIS,
Superintendent of Forests in Pegu.

Table 2.

Statements of the Measurement of a number of Teak trees of different ages.

Localities of the trees measured.	Number of trees measured.	Aggregate sum of their girths at 3 feet from the ground.	Average girth of one tree.	Average diameter of one tree.	Age of the tree.	Increase in one year.			
						From the age of	To the age of	In girth in inches.	In diameter in lines.
		ft. in.	Inches.	Inches.				″	‴
H. C. Gardens, Calcutta, ...	19	25 4	16	$5\frac{1}{11}$	6	0	6	$2\frac{2}{3}$	$10\frac{2}{11}$
Private Garden, Moulmein, ...	15	48 94	40	$12\frac{8}{11}$	22	6	22	$1\frac{1}{2}$	$8\frac{8}{11}$
H. C. Gardens, Calcutta, ...	8	52 8	79	$25\frac{3}{22}$	70	22	70	$1\frac{3}{16}$	3

Office of the Supdt. of Forests in Pegu, Rangoon,
The 16th December, 1856.

D. BRANDIS,
Superintendent of Forests in Pegu.

Table 3.

Comparative Statement of the Growth of Teak t[illegible] according to different observations.

Age of the tree.	Yearly increase in girth.	Class.	Diameter in inches	Girth in Inches					
			According to observations in						
			Calcutta and Moulmein.		The Attaran forests.	The Houndrow forests.	The Bombay forests.		Java.
			Under the supposition that one concentric ring corresponds to one year's increase						
					In the plains.	1000 ft. above the sea.	In the alluvial soil.	In the hills.	
			1		2	3	4	5	6
	"		"	"	"	"	"	"	"
0	$2\frac{2}{3}$	IV. Class (0′-3′ in girth.)	0	0	0	0	0	0	0
6			$5\frac{1}{11}$	16	.....	.....	.....	.....	.....
14			$9\frac{6}{11}$	30	.....	.....	14	8	.....
18	$1\frac{1}{2}$		$11\frac{5}{11}$	36	.....	.....	.....	.....	.....
22		III. Class (3′-4′-6″ in girth.)	$12\frac{8}{11}$	40	.....	.....	.....	.....	.....
38			$16\frac{12}{22}$	53	.....	.....	.....	.....	.....
39		II. Class (4′-6″ to 6″ in girth.)	17	$53\frac{13}{16}$	.....	.....	.....	.....	.....
40	$1\frac{13}{16}$		$17\frac{7}{22}$	$54\frac{10}{16}$	.....	.....	.....	.....	.....
61			$22\frac{15}{22}$	$71\frac{5}{16}$	.....	.....	.....	.....	.....
62			$22\frac{21}{22}$	$72\frac{9}{16}$	.....	.....	.....	.....	.....
70		I. Class (above 6″ in girth.)	$25\frac{3}{22}$	79	.....	.....	.....	.....	.....
82			$27\frac{1}{22}$	85	[1])$94\frac{1}{2}$	.....	.....	.....	.....
93			$28\frac{9}{11}$	$90\frac{1}{2}$	.....	[2])81	.....	.....	.....
100	$\frac{1}{2}$		$29\frac{10}{11}$	94	.....	.....	.....	.....	144
216			$48\frac{4}{11}$	152	.....	[3])$127\frac{1}{2}$	.....	.....	.....
249	$\frac{1}{3}$		$51\frac{12}{22}$	163	.....	[4])$152\frac{1}{4}$	.....	.....	.....

(1) This number is obtained by taking the average of the data given in Nos. 1, 2, 4 and 5 of the table, page 106 of the "Report on the Teak Forests of the Tenasserim Provinces," viz. the average of the age and of the circumference of four trees respectively 82, 88, 86 and 80 years of age.

(2) Obtained in similar manner from Nos. 6 to 12 of the same table.

(3) Ditto ditto ditto Nos. 6, 8, 9, 10 and 13 of ditto.

(4) Ditto ditto ditto Nos. 7, 11, and 12 of ditto.

D. BRANDIS,
Superintendent of Forests in Pegu.

Office of the Supdt. of Forests in Pegu, Rangoon, The 16th December, 1856.

Table 4.

Statement, showing the order in which the (6) six Divisions of the Pegu Forests will be worked and the amount of Timber to be expected from each Division.

	Names of Forest Divisions.	Length from North to South.	Breadth from East to West.	Area in square Miles.	Probable number of 1st class trees in each division.	Probable number of trees which might be brought down from the different forest divisions, if all trees were accessible and all water-courses free from obstructions.						REMARKS.
						Girdled in 1857 Felled in 1859	1857 1860	1858 1861	1859 1862	1860 1863	1861 1864	
		Miles.	Miles.									
Irrawaddie Forests.	Eastern Division. I. Tharawaddie Forests,	70	20	1,400	1,12,000	28,000	...	...	...	...	...	The timber to be collected in Tsanyong and thence to be brought to Rangoon by the Hlaine river.
	Eastern Division. II. Prome Forests, east of the Irrawaddie,	50	20	1,000	80,000	...	20,000	...	...	...	...	The timber to be collected at Prome and thence to be brought to Rangoon by the Irrawaddie.
	Western Division. III. Forests west of the Irrawaddie,	84	12	1,008	80,640	...	...	20,160	...	...	...	The timber to be collected at Henthada, Myan Oung, or other places on the Irrawaddie, and thence to be brought to Rangoon by the Irrawaddie (a small quantity, from the Bassein forests, must be collected at Bassein and there be disposed of).
	IV. Southern Forests,	36	28	1,008	80,640	...	...	...	20,160	...	...	The timber to be collected at Rangoon.
Sittang Forests.	Southern Division. V. Southern Sittang Forests.											
	a. East of the Sittang except Bhonee Forests,	34	12	408								The timber to be collected at Sittang town or at another place on the Sittang river, and thence to be brought to Rangoon by the creeks, that in the rains join the Sittang and Pegu rivers. A large portion of the timber will, for the present, not be available on account of rapids, rocks, and other obstructions in the water-way.
	b. Bhonee Forests,	16	16	256	1,56,800	...	...	...	...	39,200	...	
	c. West of the Sittang,	54	24	1,296								
	Northern Division. VI. Northern Sittang Forests.											
	a. East of the Sittang,	26	12	312	936	74,880	...	...	...	...	...	18,720	The timber to be collected at Toungoo, and thence to be brought down the Sittang and by the creeks to Rangoon.
	b. West of the Sittang,	26	24	624								
				7,312	5,84,960	28,000	20,000	20,160	20,160	39,200	18,720	

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Table 5.

Comparative Statement of the number of I. Class Teak Trees and Seasoned Timber, contained in the four districts, according to observations made by the Superintendent in 1856, *and to the statements of the Goungways as exhibited in Table II. of the Report for* 1854-55.

Forest Districts.	Number of days spent in going through each forest district.	Length of the track pursued in miles.	Area on which the trees were observed, in square miles.	Area of the whole district.	Number of I. Class trees observed by the Superintendent.	Probable number of I. Class trees in the whole district.	Number of I. Class trees in the whole district according to the statement of the Goungways.	Number of Logs Nathat and seasoned timber.	
								Observed by the Superintendent.	As stated by the Goungways for the whole district.
Khaboung,	5	40	8	288	1,296	46,656	1,650	545	1,285
North Nawing,	7	45	9	192	284	6,058	2,044	542	1,106
Khyoungzouk,	2	14	2⅘	48	162	2,777	295	228	550
Minhla and Mokha,	5	51	10⅕	400	681	26,705	11,500	654	1,320
		150	30	928	2,423	82,196	15,489	1,969	4,261

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Table 6.

Statements shewing the Expenses incurred on account of the Timber sold in the month of October, 1856.

Where sold.	Description.	No. of Logs.	Total.	Expenses incurred on account of: Felling.	Dragging and floating to the place of delivery.	Floating to the place of sale.	Securing, classifying, &c., &c.	Amortization fund for lost Elephants.	Keeping and feeding Elephants.	Auctioneering Commissions.	Total amount expended: On the whole.	Per Log.	Remarks.
Rangoon.	Yatthits,.....	...	958	0 0 0	2,253 0 0	325 2 5	39 11 11	223 9 0	55 10 10	88 13 10	2,986 0 0	3 1 9	Sold by Public Auction.
	Doodoes,.....	...	75	0 0 0	145 8 0	36 6 8	3 1 9	17 8 0	4 5 9	6 15 4	213 13 6	2 3 7	
	Loozars,.....	...	93	0 0 0	325 8 0	0 0 0	3 13 9	21 11 2	5 6 6	8 10 0	365 1 5	3 14 9	
	Doogies,.....	...	21	0 0 0	159 0 0	10 14 9	0 13 11	4 14 5	1 3 4	1 15 2	178 13 7	8 8 3	
	Stem Pieces, ...	...	2	0 0 0	5 0 0	1 0 8	0 1 4	0 7 6	0 1 11	0 3 0	6 14 5	3 7 2	
	Keel ditto,.....	...	8	0 0 0	80 0 0	4 2 8	0 5 4	1 13 11	0 7 8	0 11 10	87 9 5	10 15 2	
			1,157	0 0 0	2,968 0 0	377 11 2	48 0 0	270 0 0	67 4 0	107 5 2	3,833 4 4	0 0 0	
Toungoo.	Yatthits, ...	0	510	0 0 0	270 0 0	0 0 0	0 0 0	28 0 0	30 0 0	0 0 0	329 0 10	0 10 4	Sold to the Executive Engineers at Toungoo.
	Yatthits, ...	579	599	35 0 0	928 8 0	0 0 0	0 0 0	32 15 5	36 6 2	0 0 0	1,032 13 7	1 11 6	
	Loozars, ...	20											
	Loozars, ...	0	163	110 0 0	489 0 0	0 0 0	0 0 0	8 15 6	9 14 4	0 0 0	617 13 10	3 13 5	
	Loozars, ...	786	787	700 0 0	3,955 0 0	0 0 0	0 0 0	43 5 0	47 12 9	0 0 0	4,746 1 9	4 11 1	
	Doogies,.....	1											
	Doogies,.....	0	372	300 0 0	5,580 0 0	0 0 0	0 0 0	20 7 6	22 9 6	0 0 0	5,923 1 0	15 14 9	
	Yard Pieces, ...	20	22	20 0 0	575 0 0	0 0 0	0 0 0	1 3 6	1 5 6	0 0 0	597 9 0	27 2 7	
	Mast ditto,.....	1											
	Doogies,.....	1											
			2,453	1,165 0 0	11,797 8 0	0 0 0	0 0 0	135 0 0	149 0 0	0 0 0	13,246 8 0	0 0 0	

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Table 7.

Statement shewing the Amounts realized by the Sales of Government Timber in October, 1856, compared with the Expenses incurred on account of the same.

Stations.	Description.	Number.	Total.	Amount. Realized. On the whole.	Amount. Expended. On the whole.	Amount of Profit. On the whole.	Loss.	Amount. Realized. Per Log.	Amount. Expended. Per Log.	Amount of Profit. Per Log.	Loss.	Average length, girth, breadth and depth. Length.	Girth.	Breadth.	Depth.	Average cubical contents in cubic feet in each log.	Amount realized per Ton of 50 cubic feet.	Remarks.
Rangoon.	Yatthits,	...	409	3,080 0 0	1,274 13 0	1,805 3 0	...	7 8 3	3 2 2	4 6 1	...	In feet. 23 to 37	In inches. 36 to 43	In inches. ...	In inches. ...	25	15 0 5	Sold by Public Auction.
	Doodoes,	...	52	700 0 0	147 11 0	552 5 0	...	13 7 5	2 13 5	10 10 0	...	18	0	17	8	17	39 9 5	
	Loozars,	...	65	1,137 8 6	255 2 8	882 5 10	...	17 8 0	3 14 9	13 9 3	...	15	72	...	...	43	20 5 7	
	Doogies,	...	9	237 0 0	76 10 4	160 5 8	...	26 5 4	8 8 3	17 13 1	...	34 to 36	0	15 to 17	6 to 9	25½	51 10 1	
	Stem pieces,	...	2	65 0 0	6 14 5	58 1 7	...	32 8 0	3 7 2	29 0 10	...	35	0	20	13	63	22 12 8	
	Keel ditto,	...	8	1,030 0 0	87 9 5	942 6 7	...	128 12 0	10 15 2	117 12 10	...	60	0	19	10	79¼	81 3 8	
	Yatthits,	549	612	4,483 7 6	1,989 7 6	2,494 0 0	...	...	...	...	...	...	...	...	...	...	...	
	Doodoes,	23																
	Loozars,	28																
	Doogies,	12																
	Total,		1,157	10,733 0 0	3,838 4 4	6,894 11 8	...	...	...	...	...	...	...	...	...	...	...	Expenses 35 per cent. of the amount realized.
Toungoo.	Yatthits, inferior quality,	...	510	510 0 0	329 0 10	180 15 2	...	1 0 0	0 10 3	0 5 9	...	...	...	...	...	...	...	Sold to the Executive Engineer at Toungoo.
	Yatthits,	579	599	2,396 0 0	1,032 13 7	1,363 2 5	...	4 0 0	1 14 3	2 1 9	...	...	...	...	...	...	...	
	Loozars, inferior quality,	20																
	Loozars, inferior quality,	...	163	1,630 0 0	617 13 10	1,012 2 2	...	10 0 0	3 12 7	6 3 5	...	...	...	...	...	...	...	
	Loozars,	786	787	11,805 0 0	4,716 1 9	7,058 14 3	...	15 0 0	6 0 5	8 15 7	...	...	...	...	...	...	...	
	Doogies, inferior quality,	1																
	Doogies,	...	372	11,160 0 0	5,923 1 0	5,236 15 0	...	30 0 0	15 14 9	14 1 3	...	...	...	...	...	...	...	
	Yard pieces,	20	22	880 0 0	597 9 0	282 7 0	...	40 0 0	12 13 5	27 2 7	...	...	...	...	...	...	...	
	Mast ditto,	1																
	Doogies,	1																
	Total,		2,453	28,381 0 0	13,246 8 0	15,134 8 0	...	...	...	...	...	...	...	...	...	...	...	Expended 46 per cent. of the amount realized.

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Total No. of Logs sold, ... 3,610
Total amount realized, ... 39,114

Average amount realized per Log, ...Rs. 10-13

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Table 8.

Statement comparing the Amounts realized by the sale of Government Timber in October 1846, *after deducting all expenses except salaries, &c.,* (I.) *with the Amounts that would have been realized on the same Timber by the system of selling the seasoned trees on the Forests* (II.) *and by the Duty system* (III.)

Where Sold.	Description.	No. of Logs.	Total.	I. By sale at the stations.		II. By sale in the Forests.		III. By receiving a uniform duty.		Difference per Log of I. & II.		Difference per Log of I. & III.	
				Amount on the whole.	Realized per Log.	Amount on the whole.	Realized per Log.	Amount on the whole.	Realized per Log.	Profit of No. I.	Loss of No. I.	Profit of No. I.	Loss of No. I.
Rangoon.	Yatthits,	...	409	18,05 3 0	4 6 6	971 6 0	2 6 0	1,636 0 0	4 0 0	2 0 6	...	0 6 6	...
	Doodoes,	...	52	551 11 9	10 9 9	123 8 0	2 6 0	208 0 0	4 0 0	8 3 9	...	6 9 9	...
	Loozars,	...	65	887 11 9	13 10 6	430 10 0	6 10 0	260 0 0	4 0 0	7 0 6	...	9 10 6	...
	Doogies,	...	9	158 7 2	17 9 8	59 10 0	6 10 0	36 0 0	4 0 0	10 15 8	...	13 9 8	...
	Stem pieces,	...	2	58 1 7	29 0 8	13 4 0	6 10 0	8 0 0	4 0 0	22 6 8	...	25 0 8	...
	Keel ditto,	...	8	942 6 7	117 12 9	53 0 0	6 10 0	32 0 0	4 0 0	111 2 9	...	113 12 9	...
	Yatthits, 549 Doodoes, 23 Loozars, 28 Doogies, 12		612	2,491 1 10	4 1 1	1,623 8 0	2 10 5	2,448 0 0	4 0 0	1 6 8	...	0 1 1	...
			1,157	6,894 11 8	...	3,274 14 0	...	4,628 0 0	...	...	...	...	...
	Add the comparative profit of No. I.			...		3,619 13 8	...	2,266 11 8	...	...	...	...	...
				6,894 11 8	...	6,894 11 8	...	6,894 11 8	...	...	...	...	...
Tonngoo.	Yatthits,	...	510	180 15 2	0 5 8	1,211 4 0	2 6 0	2,040 0 0	4 0 0	...	2 0 4	...	3 10 4
	Yatthits, 579 Loozars, 20		599	1,363 2 5	2 4 4	1,507 10 0	2 8 3	2,396 0 0	4 0 0	...	0 3 11	...	1 11 8
	Loozars,	...	163	1,012 2 2	6 1 3	1,079 14 0	6 10 0	652 0 0	4 0 0	...	0 8 9	2 1 3	...
	Loozars, 786 Doogies, 1		787	7,058 14 3	8 15 6	5,213 14 0	6 10 0	3,148 0 0	4 0 0	2 5 6	...	4 15 6	...
	Doogies,	...	372	5,236 15 0	14 1 2	1,984 8 0	6 10 0	1,488 0 8	4 0 0	7 7 2	...	10 1 2	...
	Yard pieces, 20 Mast ditto, 1 Doogies, 1		22	282 7 0	12 13 4	145 12 0	6 10 0	88 0 0	4 0 0	6 3 4	...	8 13 4	...
			2,453	15,134 8 0	...	11,142 14 0	...	9,812 0 0	...	...	...	...	...
	Add the comparative profit of No. I.			...		3,991 10 0	...	5,322 8 0	...	...	...	...	...
				15,134 8 0	...	15,134 8 0	...	15,134 8 0	...	...	...	...	...

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Table 9.

Statement shewing the amount of Revenue hitherto realized by the Forest Department and that likely to be realized in future.

	Number of Logs.					Amount Realized.				Total amount of Revenue realized.	Expenses of Establishments and Contingencies.	Probable outlay of capital for the purchase of Elephants, works at the timber depôts, removal of obstructions, plantations, &c. &c.	Actual clear Revenue.
	Passed for duty.	Confiscated and unclaimed.	Sold by contract.	Brought down on account of Government.	Total.	On account of Duty.	On account of confiscated and unclaimed timber.	On account of contract.	On timber brought down on Government account, after deducting expense excluding Establishment.				
1854-55,.....	16,813	550	3,361	...	20,724	19,333 0 0	1,585 0 0	7,195 0 0	.....	28,113 0 0	25,601 0 0	.....	2,512 0 0
1855-56,.....	16,341	1,168	5,384	...	22,895	61,346 0 0	3,279 12 10	15,967 6 0	.....	80,593 14 9	37,595 0 0	.....	42,998 14 9
1856-57,.....	2,629	...	870	13,000	16,499	7,202 0 0	.....	1,777 0 0	78,000 0 0	86,979 0 0	40,000 0 0	20,000 0 0	26,979 0 0
1857-58,.....	...	...	...	21,000	21,000	.....	.....	.....	1,26,000 0 0	1,26,000 0 0	65,000 0 0	20,000 0 0	41,000 0 0
1858-59,.....	...	...	...	21,000	21,000	.....	.....	.....	1,26,000 0 0	1,26,000 0 0	65,000 0 0	20,000 0 0	41,000 0 0
1859-60,.....	...	...	...	15,000	15,000	.....	.....	.....	1,35,000 0 0	1,35,000 0 0	65,000 0 0	20,000 0 0	50,000 0 0
1869-70, After the removal of all obstructions, &c. &c.	...	...	...	25,000	25,000	.....	.....	.....	2,25,000 0 0	2,25,000 0 0	65,000 0 0	.....	1,60,000 0 0

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